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THE RELATION OF IDIOPATHIC DILATATION OF THE COLON TO PHANTOM TUMOR, AND THE APPROPRIATE TREATMENT OF SUITABLE CASES OF THESE AFFECTIONS BY RESECTION OF THE SIGMOID FLEXURE.

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In 1838, Richard Bright[1] published his *Observations on Abdominal Tumors and Intumescence*, in which he stated that "there is one class of cases more particularly liable to lead the unwary and inexperienced into error respecting the disappearance of an abdominal tumor; I mean cases of hysterical distention of the bowels; for, although the swelling in these cases is essentially tympanitic, yet occasionally, from the singular way in which the intestines are partially distended, and remain so for days and weeks at a time, they sometimes give completely the forms of tumors; and sometimes indistinct fluctuation may arise from fluid feces, or even from the coexistence of a distended bladder; and sometimes the large accumulation of hardened feces has led to the belief of a more solid tumor." He reported the case of a woman, aged thirty, seen many years before in Guy's Hospital, with a supposed abdominal tumor strongly resembling an encysted tumor. "But there were connected with this supposed tumor so many other ailments, embracing fits of hysterics, epilepsy, paralysis, abdominal and lumbar pains, so varied and so changing, that a little observation was sufficient to convince any experienced person of its real character." The patient,

[1] Guy's Hospital Reports, London, 1838, iii. 256.

however, again entered the hospital in 1824, complaining of abdominal pain and having hysterical symptoms. She had been seen by a surgeon who had proposed to excise the tumor which produced the swelling. A median incision was made for this purpose, but a tumor not being found, the wound was closed, and was not wholly healed when Dr. Bright saw the patient. Her health was in a most unsatisfactory state from a frequent tendency to diarrhœa and from a succession of pains, with occasional distention of the abdomen. She remained in the hospital some three months, during which the swelling varied considerably, and on one or two occasions was reported to have subsided entirely.

In the course of the subsequent sixteen years, as appears in an article entitled "Cases under the Care of Dr. Addison and Dr. Gull,"[1] several instructive examples of the affection in question were observed by these physicians, the latter of whom is stated to have been the first to apply the term "phantom tumor." Attention was called by them to the importance of spasmodic rigidity of a part of the abdominal parietes as "one of the most frequent sources of deception. An hysterical patient is quite capable of making a circumscribed portion of the abdominal wall rigid and hard while the rest remains comparatively flaccid. . . . The recti muscles are peculiarly apt to be the seat of these contractions, which may, however, also occur in the lateral regions of the abdomen. . . . Hardened masses of feces are probably, however, the most frequent of the exciting causes of the affection."

Later, the idea of phantom tumor became so extended as to comprehend any circumscribed mass in the abdomen which should appear and disappear from time to time. Greenhow,[2] for example, reported five cases as "Phantom Tumors of the Abdomen." The first two were apparently pedunculate pelvic tumors, the third and fourth might have been a movable kidney, while the fifth, presumably, was a movable kidney or spleen. All were regarded as spasmodic, seated "probably in the abdominal muscles, although in every instance the tumor appeared to be in the abdominal cavity." Furthermore, evanescent tumors of the trunk and of the extremities have been reported by some writers as instances of phantom tumor. Dilated and prolapsed stomachs, intermittent hydronephrosis, and transitory indurations of the mammary gland also were thus designated.

We are indebted to our honored associate, J. M. Da Costa,[3] for a restoration of the original conception of the term and also for a most important amplification—namely, that phantom tumors are not necessarily limited to hysterical persons. According to him, "The chief element in their production is partial contraction of the abdominal walls, par-

[1] Medical Times and Gazette, London, 1854, ix. 343.
[2] Lancet, London, 1857, i. 58.
[3] Medical Times, Philadelphia, 1871, i. 449.

ticularly of the recti muscles, with more or less tympanitic distention of either the stomach or the intestine. Then a certain amount of constipation, and a large quantity of subcutaneous fat in the omentum, will modify some of the phenomena; for I do not think that all cases are precisely alike or can be explained according to an exact formula. The frequent occurrence of these phantom tumors in hysterical persons is also to be taken into account, and the coexistence with hysteria may show itself in fits of hysteria, in convulsions, or in hysterical palsy. But do not fall into the mistake of supposing any necessary connection. I have met with these tumors in men who were not very impressionable."

These views concerning the nature and the method of origin of phantom tumors have prevailed with slight modifications up to the present time. Osler[1] and Tyson[2] adopt the explanation of Gowers, according to whom phantom tumors result from a relaxation of the recti, a spasm of the diaphragm and abdominal muscles, gaseous distention of the intestine, and an arching forward of the spine. Wharton Sinkler, in the Loomis-Thompson system,[3] states that "Sometimes an enormous amount of gas accumulates in the stomach and intestines, which distends the abdomen to an extraordinary extent. This condition constitutes the so-called 'phantom tumor' sometimes seen in hysteria. Constipation is frequently present, and the bowels in some cases may not be opened for weeks."

In reviewing the reports of cases of phantom tumor published in the various medical journals it is evident that the described tympanitic tumors are by no means of uniform significance. They vary not only in extent, involving more or less of the abdominal cavity, but they vary also in duration, in severity of symptoms, and in result. Though found usually in adult females, and simulating in shape and size the pregnant uterus at full term, or an ovarian cyst, they have been observed in young girls and in men. As a rule, of long duration and of slow and gradual formation, they may increase rapidly within a few months or within a few days. Mattison's[4] patient supposed herself pregnant. Menstruation had ceased, morning sickness, quickening, enlargement of the abdomen and breasts—all were observed at the proper time and in regular course. Ramskill and Jones[5] state that their patient, a girl of nineteen, had been several years in attendance at the Metropolitan Free Hospital. Examinations made two years apart showed no material change in the size of the tumor, which eventually caused the patient to appear like one at the full period of pregnancy. Bright's original case was observed during a period of many years in

[1] The Principles and Practice of Medicine, third edition, 1898, 1114.
[2] The Practice of Medicine, 1896, 1072
[3] American System of Practical Medicine, 1898, iv. 705.
[4] Medical and Surgical Reporter, 1863, x. 201.
[5] Medical Times and Gazette, London, 1859, ii. 579.

which the tumor was thought to be an ovarian cyst, and the patient was operated upon for its extirpation. Storer's case, reported by J. C. White,[1] was a girl of fourteen, in whom the tumor had been present for a year, having increased rapidly in size within eight months.

Although chronic, persisting, or recurring constipation is the rule, acute intestinal obstruction sometimes is stimulated, as is illustrated in the following case coming under my observation: In 1894, a woman, aged twenty-one years, was referred to me by Dr. W. O. Hunt, of Newton. During early childhood she had occasional convulsive attacks. At the age of sixteen or seventeen she suffered for a year from nervous exhaustion. In the two years previous to my first visit she had repeated attacks of severe pain in the lower abdomen, each lasting some ten minutes, at irregular intervals, and without obvious cause. Shortly before the visit they had occurred two or three times daily, and occasionally were associated with a discharge of blood from the rectum. Dejections were usually well-formed, and as many as two daily. There was no loss of weight or color, and there was nothing abnormal found by me on physical examination. Three weeks later an attack of pain was followed by an arrest of intestinal peristalsis, neither gas nor feces being evacuated, despite the use of saline laxatives and enemata. At the end of four days, during which vomiting had occurred, the symptoms of obstruction still continued. The abdomen was markedly swollen, and a distended intestinal coil was to be felt in the left half of the belly. Three pints of water were injected into the rectum without causing discomfort. A large quantity of pale urine was voided. At this time Dr. M. H. Richardson saw the case and agreed as to the expediency of an exploratory incision. After the patient was etherized the abdomen again was palpated, when gas escaped from the rectum; repeated firm pressure caused the continued expulsion of gas, until the entire abdomen became everywhere soft and yielding to the touch. Since then there has been no return of the previous symptoms.

It is recognized that the nature of the disturbance in this case is not wholly free from doubt, but a diagnosis of hysterical tympanites seemed the most probable. It was based upon the neurasthenic, almost hysterical, antecedents of the evidently neurotic patient, whose general appearance was that of one in vigorous health; upon the immediate relief afforded by pressure when she was etherized, although all efforts without anæsthesia were of no avail, and, finally, upon the subsequent complete immunity from all abdominal discomfort.

In the diagnosis of phantom tumors of the abdomen special stress is laid upon their disappearance under anæsthesia. O'Donnell[2] had a male patient whose tympanitic abdomen was as large as that of a

[1] Boston Medical and Surgical Journal, 1855, liii. 19.
[2] Medical Times and Gazette, London, 1855, ii. 47.

woman in the eighth month of pregnancy. Under chloroform the enlargement immediately disappeared, and the abdomen for a while remained in a normal state. Simpson previously had produced the same result in like manner in a woman who supposed herself ten months pregnant. Ramskill and Jones[1] also administered chloroform to their patient, who, for two years, was considered to have suffered from "hysteric tympanites or phantom tumor of very large size." As the patient became unconscious the abdomen at once flattened until there was not the slightest appearance of a tumor. As the effect of the chloroform passed away the abdomen quickly resumed its previous shape, and was nearly as prominent as ever when consciousness was regained.

A notable fact in the history of this subject appears from the investigation of the periodical literature of recent years. Reports of instances of phantom tumor are rarely to be found, whereas within the past fifteen years a considerable number of cases have been published which closely simulate in their characteristics those of phantom tumor, and in which the tumor has proved to be a permanent enlargement of the colon. Little and Calloway,[2] to be sure, had reported previously a case of enormous dilatation with hypertrophy of the colon, especially of the sigmoid portion, in an imbecile thirty-four years of age. The abdomen was forty-five inches in circumference at the navel, and its enlargement was found to be due almost wholly to the distended large intestine. The transverse colon was about six inches in diameter, and the descending colon and sigmoid flexure formed an immense pouch extending from the left hypochondrium into the umbilical and hypogastric regions. Peacock[3] also described a case of fatal constipation from excessive dilatation of the colon. The patient, twenty-eight years of age, had been constipated from birth, and had suffered much from flatulence. Although he enjoyed relatively good health until within six weeks of his death, the symptoms of obstruction then became grievous, and the abdomen appeared like that of a woman just previous to confinement. The large intestine from the cæcum to the upper part of the rectum was found enormously distended, and contained fully fifteen quarts of semi-solid feces.

In 1884, however, Gee[4] published his communication on "Idiopathic Dilatation of the Large Intestine," which proved to be the immediate predecessor of a considerable number of articles on the same subject. He stated that "One kind of great and fatal tympanites is an extreme dilatation of the large intestine in whole or in part. The dilatation may be called idiopathic, inasmuch as it constitutes the whole of the disease, and the foregoing conditions or causes cannot be discovered.

[1] Loc. cit. [2] Transactions Pathological Society of London, 1851, iii. 106.
[3] Transactions Pathological Society of London, 1872, xxiii. 104.
[4] St. Bartholomew's Hospital Reports, London, 1884, xx. 19.

This disease may be compared with a like dilatation, also called idiopathic, which affects the œsophagus and the stomach. . . . . At present, for want of a better explanation, I think that mere constipation and retention of wind are the cause of the dilatation." His illustrative case is that of a boy of four and a half years, who was constipated when three months old, and whose abdomen continued to swell from the time he was a year old.

The purport of these publications is to maintain that increase in the size of the large intestine at times occurs without any obvious organic or mechanical cause other than fecal accumulation, sufficient to produce discomfort, distress, and deformity, and to prove repeatedly the immediate cause of death. The most constant symptom is constipation and the most positive sign is abdominal distention. Two types of this affection are evident: in the one the disturbance begins early in life, even in infancy; in the other it becomes manifest only at a more advanced age. The former often is called congenital, although the accuracy of this term is to be questioned. To be sure, Peacock[1] and Hughes[2] state that in the cases reported by them there were increasing constipation and abdominal enlargement from birth. One of Osler's[3] patients, an infant of seven months, had but five or six natural evacuations previous to having been seen by him. On the other hand, although the case reported by Walker and Griffiths[4] was observed to have an unusually large abdomen within a few weeks from birth, nevertheless the bowels are said to have acted regularly. Rolleston and Haward[5] state that abdominal swelling began in their patient at the age of two months. In Formad's[6] case, on the contrary, the most remarkable on record for the degree of deformity, constipation first became noticeable at the age of two years. To these cases the following is added:

A girl, fourteen years old, came under my care at the Massachusetts General Hospital in 1894, on account of a swollen abdomen (Fig. 1). She had been constipated all her life, and the enlargement began when she was two years of age, and continued to increase in size up to the date of her admission. Three years before this there was considerable sharp, intermittent pain in the left flank, and a needle was thrust into the abdomen somewhere below the navel on the right side. No fluid was withdrawn. Otherwise she has always been in excellent health. She has attended school regularly and has seemed as strong as other children. There was no complaint of any disturbance whatsoever, with the above exception. She was well developed and sufficiently nourished. The abdomen was much enlarged, measuring thirty-one inches in circumference. It was tympanitic throughout, except in the right iliac fossa, where there was

[1] Loc. cit. [2] Transactions Pathological Society of Philadelphia, 1887, xiii. 40.
[3] Archives Pediatrics, 1893, x. 111.
[4] British Medical Journal, London, 1893, ii. 230.
[5] Transactions Clinical Society of London, 1896, xxix. 201.
[6] University Medical Magazine, Philadelphia, 1892, iv. 625.

a diffused dulness. The surface was in places slightly irregular and ridged from peristalsis of the underlying intestine. On palpation the abdomen was everywhere soft and without tenderness. The bowels were kept open by enemata, and although several evacuations might occur daily, there was no material diminution in the abdominal enlarge-

FIG. 1.

ment. The injection of five pints of water caused dulness on percussion in the left half of the abdomen. She remained in the hospital nearly four weeks, and several months afterward her mother wrote that there was no improvement, and that she was as "costive as ever." Recent attempts to discover her whereabouts have been unavailing.

If it be admitted that in certain of the above cases a congenital cause for the dilatation may have existed, it must be recognized also that absolute evidence on this point is lacking. It is apparent, furthermore, that in some of the patients the dilatation began at such an interval after birth as to render the congenital origin very doubtful.

M. Treves,[1] however, in a recent article entitled "Idiopathic Dilatation of the Colon," maintains that all cases of this affection "In young children are due to congenital defects in the terminal part of the bowel, that there is in these cases an actual mechanical obstruction and that the dilatation of the bowel is not idiopathic." He bases this view on the evidence furnished by a patient with dilated colon from whom he successfully removed not only the descending colon, but also that part of the bowel corresponding to the sigmoid flexure and to the rectum, which

[1] Lancet, London, 1898, i. 276.

were represented by a solid-looking though pervious tube eight or nine inches long, and about the size of an adult's forefinger. Support is found for his opinion in the cases reported by Dodd[1] and Atkin,[2] in which there was marked stenosis of portions of the large intestine. He offers, also, in favor of his suggestion the obervations of Osler, Walker, Formad, and of Rolleston and Haward (*vide supra*).

It may be stated in behalf of those who recognize the existence of a genuine idiopathic dilatation of the colon in young children, that there are repeated instances in which the affection begins in early infancy, progresses more or less continuously, and at a laparotomy or a post-mortem examination is without sign of any congenital malformation of the bowel. Such instances are to be found even among those referred to by Mr. Treves in support of his view. In but one of Osler's cases, for example, was the opportunity offered for a satisfactory physical examination of the intestine. After an abdominal section by Halsted, although the entire colon was found enlarged and "the sigmoid flexure was twisted on itself, but not so as to cause any obstruction," no stricture of the rectum could be ascertained. A post-mortem examination was made in the cases reported by Walker, Formad, and by Rolleston and Haward, and no evidence of a constriction was observed.

It would seem more in harmony with the facts to recognize that there are two varieties of infantile dilatation of the colon. The one is due undoubtedly to a defect of development, hence is a true form of congenital dilatation, the result of malformation of the bowel, existing at birth and then at once producing its disturbances. The other makes its appearance within weeks or months after birth, gives no evidence of any arrest of development of the bowel, and for purposes of classification should be called idiopathic. Infantile dilatation of the colon thus may be congenital or idiopathic, but a congenital idiopathic dilatation of the colon from this stand-point would be a misnomer.

The idiopathic cases properly so called are conceivably those in which defective expulsive power is the prime factor, leading gradually to more or less abundant accumulation of feces and consequent dilatation of the sigmoid flexure, with occasional complete evacuation of the bowel, as in the case reported by Hughes, but with recurring retention extending over a prolonged period. As the lower portion of the bowel, especially the sigmoid flexure, becomes enlarged, an acquired mechanical impediment to the emptying of the descending colon, and perhaps of other portions of the large intestine, is established, giving rise to dilatation and to hypertrophy of the muscular coat. This impediment is likely to become all the greater as the loop of the sigmoid flexure becomes elongated and dilated, with its liability to kinks, even to a twist, as

[1] Lancet, London, 1892, i. 1299.

[2] Lancet, London, 1885, i. 203.

proved to have occurred in the case reported by Osler. In fact, the significance of elongation and dilatation of the sigmoid flexure in the production of twists of this portion of the colon are too well known to require comment. The greater the degree of distention the more impaired becomes the action of the accessory muscles of defecation, especially those of the abdominal wall, and thus may arise the enormous degrees of distention which are the eventual outcome in the cases in question.

The published instances of idiopathic dilatation first made manifest in adult life are relatively few, but may take place under the same general conditions as in this variety of the infantile series. The case reported by Little and Calloway[1] was an imbecile, one of a class notoriously liable to suffer from neglected defecation. Money and Paget[2] state of their patient that the bowels always acted regularly, with the exception that lately they were somewhat constipated. Nevertheless, a big, scybalous mass of stony hardness was found in the colon. The patient of Herringham and Clarke[3] is stated to have been always constipated, at times without a dejection for eight days. Richardson's patient,[4] a man of forty-seven years, was in good health until the age of forty, when constipation became apparent and increased in severity. Finally symptoms of acute obstruction arose, and a half twist of the sigmoid flexure was found, corrected, and stitched to the abdominal wall. Five months later another attack of acute obstruction occurred, and again this portion of the colon was found twisted. It then was resected successfully, with subsequent relief of the symptoms.

Occasionally cases may be encountered which occupy an intermediate position between the infantile and the adult groups. I am indebted to my colleague, Dr. F. B. Harrington, of Boston, for the notes of such a case.

His patient, about forty years of age, since childhood had a distended abdomen, with constant abdominal distress and much difficulty in emptying the bowels. At the age of twenty years he had an acute affection resembling intestinal obstruction and accompanied with enormous distention of the abdomen. At this time Dr. P. Wadsworth, of Malden, treated him by plunging a trocar through the abdominal wall into the intestine. A great quantity of gas escaped, the swelling subsided, and defecation soon was resumed. Thirteen years later a similar illness occurred, but of less severity. In the subsequent seven years there were four or five such attacks, each lasting from one to four weeks, during which time the patient was confined to his bed, suffering from vomiting and intense pain. Relief followed the passage of large quantities of gas and liquid feces.

The last attack began March 6, 1898, with severe pain and vomiting, unrelieved by rectal enemata or by doses of salts. When seen a week

[1] Loc. cit. [2] Transactions of the Clinical Society of London, 1888, xxi. 103.
[3] St. Bartholomew's Hospital Reports, 1895, xxi. 57.
[4] Transactions of the American Surgical Association, 1897, xv. 585.

later by Dr. Harrington the face was pinched and haggard, the temperature 102° F., and the pulse 120. The abdomen was so distended as to resemble that of a woman with a large abdominal tumor. It was everywhere tympanitic. A median laparotomy was performed, and the cause of the enlargement was found to be the dilated sigmoid flexure, which extended from the pubes nearly to the ensiform cartilage. It was tapped, and enormous quantities of gas and fecal matter were removed. This portion of the colon was then withdrawn from the abdomen and resected. The patient lived for a week, during which time there were frequent movements of the bowels and relief from pain. Death was due to septic peritonitis of a mild grade. The united ends of the large intestine were in good condition, and there was no evidence of any leakage. Dr. Harrington states, "With a similar case in similar conditions I should make an artificial anus and wait for improvement before doing a resection."

In comparing the histories of cases of chronic phantom tumor and of idiopathic dilatation of the colon the similarity in the symptoms of the two affections is beyond question. In each there is marked constipation, frequently leading to the retention of feces. In each there is a tympanitic distention of the abdomen, often of extensive degree, and present throughout a series of years, although subject to variations in size, even to a return of the normal shape in anæsthesia. In each exacerbations of abdominal distress are apt to accompany temporary increase in the size of the abdomen. The phantom tumor is not necessarily limited to persons of hysterical tendencies, and the patient with a dilated colon may be hysterical or neurasthenic. With so striking a resemblance in the clinical characteristics it seems probable that the anatomical changes are identical. Fatal cases of phantom tumor have rarely been reported. Cullen's[1] patient died of inanition. The abdomen had been distended for five years, and the symptoms so suggested ovarian disease as to lead to the thought of ovariotomy. It is stated that no tumor was found at the autopsy, but there is no mention made of the condition of the colon. Even in the case reported by Bright, in which the interior of the distended abdomen was exposed by a laparotomy, we learn merely that no tumor was found. It is obviously inconceivable that such extreme tympanitic distention of the abdomen could exist for so long a time without the presence of gas in the intestines, and from the probability that the function of the stomach and small intestine was, as a rule, but little impaired, it seems likely that the gas must have been accumulated in the dilated large intestine. Furthermore, as already mentioned, examples of chronic phantom tumor, as described by Bright and others, are no longer reported, but cases with similar symptoms are published with satisfactory evidence that dilatation of the colon is the constant characteristic.

[1] Virginia Clinical Record, Richmond, 1871, i. 153.

The following statement is added for the purpose of confirming the above interpretation of the subject:

Miss ——, thirty-seven years of age, entered the Massachusetts General Hospital in November, 1898. Since the age of fifteen, when

FIG. 2.

FIG. 3.

"threatened with typhoid fever," she has been subject to periodical attacks of weakness, without obvious cause, occurring two or three times a year, rather increasing in frequency of late. The attack which

took place eighteen months previous has never been wholly recovered from. During this period she has been unable to work, and has been confined to her bed a couple of months at a time on four or five different occasions. The abdomen began to enlarge from the onset of this attack, and gradually has reached its present size (Figs. 2 and 3). During the past year there has been more or less constant pain in the right iliac fossa, in which there is the sensation as of a lump. Of late the pain has extended upward into the right lumbar region, and in the past six weeks it has been worse than ever. For years she has been obliged to use some laxative two or three times a week, and several times a year would have no movement of the bowels for a week. The catamenia have been irregular and painful since the age of fifteen, a space of two years once having elapsed without their appearance. The interval between the successive periods may be from one week to three months. The use of the catheter is at times necessary to enable the bladder to be emptied. She has no appetite, is weak, suffers from constant abdominal pain, and attributes all her discomfort to the condition of her bowels, which causes nausea and short breath. Although there had been some loss of flesh, the face was florid, an appearance stated always to have been present. The waist was small, the epigastrium flat, but below the navel the abdomen was uniformly swollen, tense, and tympanitic to a marked degree, and measured thirty-three inches in circumference. There was diffused tenderness in the right flank. There was no alteration in the outlines of the stomach, spleen, and liver, as determined by percussion. Palpation of the region of the kidneys was rendered useless by the resistance of the overlying muscles. The pelvic examination was negative. There was neither albumin nor sugar in the urine, and the blood showed 68 per cent. of hæmoglobin, 5,616,000 red corpuscles, and 13,400 leukocytes three hours after dinner. The stomach had a capacity of twenty-five ounces of water, and its contents showed free HCl. Lactic acid also was present. When the rectal tube was inserted there was neither obstruction nor escape of flatus, nor did any change follow in the appearance of the abdominal enlargement. After the patient was etherized the abdominal walls became flaccid and the tumor disappeared, but there was no especial diminution in the circumference of the abdomen. There was merely a change of shape, the tumor-like character of which at once reappeared as the senses were recovered. There was much splashing on palpation of the region of the colon, and attempts to inject liquid and air into the bowel produced only a moderate degree of additional distention.

During the patient's stay in the hospital purgatives produced watery evacuations, but neither laxatives nor enemata caused any material alteration in the shape and size of the abdomen. She was informed of the probable cause of her condition and of the doubt of any permanent relief except by a surgical procedure of a severe and serious nature. Any reasonable attempt to enable her to resume an active life was welcomed. She was transferred to the care of Dr. C. B. Porter, who made a median incision, through which the greatly enlarged sigmoid flexure bulged. It was apparent that there was neither an organic stricture nor a fecal impaction, and as her pain had been referred to the right iliac region, and as the vermiform appendix was closely attached to the abdominal wall, Dr. Porter decided to remove the appendix with the hope of relieving the pain.

This operation, speedily recovered from, gave no permanent relief, and she returned to the hospital, in accordance with my advice, for the purpose of having a portion of the colon resected. Dr. M. H. Richardson, who had succeeded Dr. Porter in charge of the surgical ward, reopened the abdomen April 5, 1899, and removed the enlarged sigmoid flexure, which represented the chief constituent of the abdominal swelling, although there was some dilatation of the rectum and the descending colon. Convalescence has progressed favorably and without interruption.

This case presented the essential characteristics, even in its reaction to anæsthesia, of a phantom tumor, occurring late in life in a woman of pronounced neurasthenic type. It likewise showed the features of idiopathic dilatation of the colon free from obvious congenital peculiarities, and having as its sole conspicuous antecedent a constipated habit, but no history of fecal impaction at any time. The phantom tumor proved to be a dilated colon.

In advocating resection of the sigmoid flexure for suitable cases of idiopathic dilatation of the colon or for chronic phantom tumor, in which the former condition presumably exists, I simply follow in the footsteps of Mr. Treves. It was his brilliant operation to relieve a patient from the effects of congenital malformation of the lower portion of the large intestine which first suggested to me the expediency of the above procedure in a case of genuine idiopathic dilatation of the colon.

The history of such cases shows that often under medical treatment the deformity and disability are permanent, generally progressive, attended by suffering, and ending usually in death.

The resection of the dilated sigmoid flexure takes from the abdomen the chief cause of distention and of a fecal reservoir, which has become unnecessary, is burdensome, a source of pain, and menace to life.

It has successfully been removed, together with the descending colon, rectum, and anus, by Treves, in a case of congenital stenosis of the bowel, and the dilated sigmoid flexure alone has been removed by F. B. Harrington and by M. H. Richardson to relieve acute obstruction.

Resection may be preceded by colotomy, as in the case of Treves, and, as Harrington finds, indicated when symptoms of acute obstruction are present. Colotomy in such cases, however, should be merely a temporary expedient to relieve the patient from immediate peril and to permit him to enter into a state suitable for resection. The latter operation is best undertaken when the patient is comparatively free from all acute discomfort.

CASES OF TYPHOID CHOLECYSTITIS ENDING IN RECOVERY.[1]

By J. M. Da Costa, M.D., LL.D.,
of Philadelphia.

It is only of late years that we have recognized cholecystitis in typhoid fever, and it is generally looked upon as a very serious complication. So, indeed, it mostly is. In a paper which I presented last year to this Association, "On the Significance of Jaundice in Typhoid Fever," and which has been published in its *Transactions* as well as in The American Journal of the Medical Sciences, July, 1898, I stated the results of fifty-eight cases of typhoid cholecystitis I had collected to be thirty-nine deaths and fifteen recoveries, while in four the result was uncertain or not mentioned. It would, therefore, appear that typhoid cholecystitis is fatal in about two-thirds of the cases; in those that got well recovery in fully half the cases was the direct result of operative interference. Yet it is likely that, as we study the subject closely, and learn to recognize more readily this complication of typhoid fever, we shall find that the recoveries are more frequent than supposed. It is from the very grave cases, which alone have been mostly published, that our conclusions have been drawn.

To the list of recoveries from typhoid cholecystitis I can now add three cases, two of which happened in soldiers and one in a young girl. They were all under observation at the Pennsylvania Hospital.

Case I.—M. B., a soldier, aged thirty-two years, with typhoid fever, in whom the Widal test on two occasions gave positive reactions, had many complications in the course of a long illness, such as phlegmasia dolens, otitis media, and swelling of the knee. There was a relapse on the twenty-ninth day of the disease, another one on the sixty-third day, and a third one on the ninety-third day; in the latter malarial organisms were found in the blood. It is not, however, the purpose to give a full history of this protracted and remarkable case, but rather to state that the deep typhoid infection manifested itself also in his gall-bladder, for in the second relapse tenderness was noticed in the upper part of the abdomen, chiefly below the ribs on the right side, and slight jaundice occurred; no tumor was to be felt. An examination of the urine showed bile-pigment, without albumin or sugar or casts being found; the urine was acid, of specific gravity 1020. The temperature, which in this relapse had reached 104° F., had declined to 98° when the jaundice was noticed. There were no marked gastric symptoms. The jaundice and the tenderness slowly passed away. Six days after bile was first detected in the urine this no longer contained it. The patient finally recovered entirely, notwithstanding the many complications.

[1] Paper presented to the Association of American Physicians at the annual meeting held in Washington, D. C., May, 1899.

In this case, in which the profoundest typhoid fever infection was manifest, the cholecystitis was comparatively light. While there was pain in the region of the gall-bladder and sensitiveness, there was no tumor, and, except for jaundice, which, though slight, attracted attention, it is very likely that the disorder would have been overlooked. In the next case the symptoms were much more marked, and a tumor was evident.

CASE II.—C. E. B., a soldier, aged twenty-three years, had a severe case of typhoid fever in which the temperature for thirteen days ranged between 104° and 105° F. There was diarrhœa and cough, and considerable pulmonary congestion, and, later, a broncho-pneumonia on the right side. On the sixteenth day of the disease, when the evening temperature was 104.6° F., soreness to the touch was noticed in the region of the gall-bladder; there was also pain in the abdomen, especially at the upper part, but at first no jaundice. Nor did the examinations of the urine show bile-pigment or sugar or casts. The urine had a specific gravity of 1009 and a trace of albumin. No vomiting occurred. Six days subsequently both pain and tenderness were found to be distinctly localized over the gall-bladder, and a small, round tumor was palpable. No altered hue of the face or conjunctivæ was discernible, but the reaction for bile-pigment in the urine was very marked. The temperature ranged about 102° F.; the stools were liquid, not offensive, nor materially changed; the tongue was clean; there was rigidity of the abdominal walls, especially on the right side. The patient expressed himself as greatly relieved by the local use of the tincture of iodine. Three days afterward the pain had gone, the temperature had declined, and the swollen gall-bladder could be no longer felt. Recovery was complete, but not rapid.

This case is instructive in showing how pain and tenderness, and even tumor, precede the icterus, which, indeed, may only manifest itself by bile in the urine or be wholly absent. The temperature did not rise with the complication. It was high when this started, as it had been throughout the case, and declined, rather than advanced, with the decided manifestations of the malady. The symptoms were very clearly marked, but not typically violent, as they were in the next case.

CASE III.—Theresa L., aged eight years, was admitted on February 3, 1899, into the Pennsylvania Hospital with typhoid fever. She had always been a healthy girl; with the exception of having had measles and whooping-cough some years ago, there was no history of disease. When admitted she had been ill for seven days with diarrhœa, cough and fever. Her temperature was found to be 105° F.; the pulse 142; the respirations 32. The liver dulness was small, the abdomen tympanitic; the urine had a specific gravity of 1020, and contained a small amount of albumin, but no casts. Some moist râles were detected at the lower part of the lungs posteriorly on the right side, but no dulness existed. The next day typical rose-spots appeared on the abdomen. The Widal test gave a positive reaction on the tenth day of the disease.

The patient was treated by betanaphtol and very constant sponging, and though the case proved a severe one, the temperature for the first week of her stay in the hospital being often in the neighborhood of 104° F. and the urine having to be drawn by catheter, she did well, and by the twenty-seventh day of the disease it was noted that the temperature was normal or subnormal, with the exception of a single rise to 100° F. Convalescence was looked upon as assured, when the child began to vomit, complained bitterly of pain in the abdomen, and the temperature quickly rose to 104° F. The pulse was 140. The question of perforation and peritonitis at once arose, as well as that of an appendicitis. But the high temperature and absence of collapse were against the former, and the fact that there was no tenderness or swelling in the right iliac fossa or at McBurney's point—indeed, that all the discomfort was at the upper part of the abdomen—set aside the latter. In the next few days the symptoms became more and more significant. The vomiting continued; at first curdled milk with bile-stained fluid, several ounces at a time, was ejected, then the same quantity of a pure, brownish, bilious fluid. Nothing was retained on the stomach—not even water—though a little later one-tenth of a grain doses of calomel stayed down, and small amounts of peptonized milk, and, still later, brandy and cracked ice; but the child had to be almost entirely nourished through the rectum, and sustained by hypodermatic injections of strychnine. There was some looseness of the bowels, and greenish stools were passed. The pain was very great, and she screamed with it; it was entirely referred to the upper part of the abdomen. Considerable tenderness over the region of the gall-bladder existed, and, on palpation, a tumor about the size of a lemon, and having the shape of the gall-bladder, could be felt and even seen through the abdominal walls; both recti muscles were very rigid, the right especially; the tenderness extended to the left hypochondrium.

Applications of ice did some good, but the great restlessness of the child caused them to be exchanged for hot fomentations, which she liked better. The conjunctivæ at first were not discolored, but they became increasingly so, until the jaundice was very perceptible; the urine contained bile-pigment, but no albumin. The temperature—which, soon after the beginning of the attack, marked 101° F., with pulse of 124 and respirations 24—reached 104° F. for a short time, but it soon subsided, and the thermometer indicated between 99° and 101° F., while the tumor and pain were manifest. In the course of the case the whole abdomen became tumid, and the tenderness as marked in the left hypochondrium as in the right. The spleen did not appear to be enlarged; there was no ascites. Abdominal pain, tenderness, and tumor gradually subsided, though even toward the end of the case occasional pain in the region of the gall-bladder recurred. The child became greatly emaciated during the attack, and showed in her face the severe illness through which she was passing. But a gradual recovery took place, and she was discharged from the hospital on March 31st in good condition.

In reviewing this case, the violence of the pain stands out as the most prominent symptom. I have never in any instance of typhoid fever seen it equalled, and the child often shrieked with it. There was no

doubt in her mind of its seat; when questioned she always put her hand to the region under the ribs on the right side. The pain was aggravated by the incessant vomiting. In the other cases reported in this paper the jaundice was slight; here it was very marked. The gravity of the symptoms made me think of asking one of my surgical colleagues to perform an operation; but as, when I was considering the propriety of surgical interference, improvement began to show itself, this was deferred, and the child recovered without. From the absence of sweating and chills—though this is not conclusive—I believed the cholecystitis not to be purulent, which influenced my decision. On the whole, this is the most marked case of typhoid cholecystitis ending in recovery which I have met with. It is worthy of note that it occurred after convalescence had set in. Cholecystitis in typhoid fever is a complication generally arising in the third or fourth week of the fever. In one of the cases reported in this paper it came on in the relapse.

The treatment in the cases detailed consisted for the most part in the administration of fractional doses of calomel, frequently repeated, in combating the nausea, and in the local use of ice or of poultices. The former is to be tried first, and is, I believe, the more efficient. Counter-irritation, with turpentine stupes or with iodine, may also be used, and Case I. thought he derived much benefit from this. For the relief of the pain, hypodermatics of morphine may be necessary, and, as in Case III., the circulation may have to be supported by hypodermatics of strychnine and of digitalis.

THE INFLUENCE OF VARIOUS DIETS UPON THE ELIMINATION OF THE URINARY NITROGEN, UREA, URIC ACID, AND THE PURIN BASES.

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Since the publication by Salkowski, in 1897, of his improved method for the estimation of the xanthin bases in the urine, we have been in the possession of a feasible and accurate procedure for the quantitative determination of these important substances. Simultaneously, the researches of Krüger and Salomon have given us reliable qualitative methods for the differential study of the individual members of the purin group. Thus we are now in a position to undertake comparative studies of the relations of these bases to various ages, states of health, diets, and diseases. We possess almost no accurate knowledge of the physiological or pathological relations of these bases. Nearly all the work already done has been carried through with the Krüger-Wulff

method, whose unreliability, even for clinical work, has been conclusively demonstrated. Obviously, we need first of all physiological data, and it has been the purpose of these researches, whose partial results are herein reported, to furnish some such data.

I have believed it most advantageous, to the end of a perfect control of the studies, to submit myself to the diet experiments. Thus I was enabled to control specifically every detail of the studies, something which is impossible under other circumstances. My weight is about 160 pounds. My general health is perfect; my constitution is of the robust or plethoric type. The general plan of the studies has been as follows: The specific diet having been entered upon, the collection of the entire daily urine was begun upon the *third* day of the diet, and was continued for *six* successive days. The body-weight was noted before and after each period Between these periods of different diet a mixed diet was employed, except that tea, coffee, cocoa, chocolate, and alcoholic beverages were entirely avoided. I do not use tobacco. The only exercise taken was that involved in the laboratory work required for the estimations, which, together with other work, amounted in all to about seven hours of laboratory work daily. Seven hours of sleep, the normal personal quota, were taken daily. The total urinary nitrogen—the urea, the uric acid, and the purin bases—were estimated daily during the six days of each period; the total nitrogen was estimated by the Kjeldahl method; the urea by the Mörner-Sjöqvist method; the uric acid by the Salkowski-Ludwig method, as taught by Salkowski, and the purin bases by the new Salkowski method, for which I have only praise to utter. The total urine of the twenty-four hours was always diluted to 2000 c.c. (except when it naturally exceeded that volume), in order to have the determinations conducted under constant comparative conditions. For the estimation of the purin bodies, 1400 c.c. of this diluted urine were mixed with 350 c.c. of magnesia mixture and the phosphates removed by filtration; 350 c.c. of the filtrate were then used for the determination of the uric acid and 1125 c.c. for the bases; thus large quantites were used and the errors of manipulation correspondingly reduced. Since the method for the bases is not yet widely known, I will describe it in its main details: After the phosphates are removed from the urine by the magnesia mixture, the purin bodies, uric acid and the bases, are precipitated as silver-magnesia compounds on the addition of an excess of silver nitrate, and the precipitate kept out of solution by the strongly ammoniated reaction, which at the same time holds the silver chloride in solution. After standing one hour in the dark the gelatinoid precipitate is filtered and carefully washed until free of silver and nearly free of chlorides. It is then washed into a beaker, a few drops of HCl added, and after standing a few moments the silver is precipitated by leading a stream of H_2S through the solu-

tion. When this is completed the solution is heated to steaming and the silver sulphide filtered off. The filtrate, which contains the uric acid and the bases, is now evaporated to dryness on the water-bath. When dry, 30 c.c. of a 3 per cent. solution of H_2SO_4 are added, heated to steaming, and then allowed to stand over night. In this acid the uric acid is insoluble, the bases soluble, and thus they are separated. The solution is then filtered and the precipitate well washed with 3 per cent. H_2SO_4. The total filtrate, which contains the bases alone, is then made strongly alkaline by the addition of ammonia, and the bases again precipitated by the addition of silver nitrate. After standing one hour the precipitate is brought upon a fine ash-free filter, previously washed with dilute nitric acid and then with water, and is washed until freed of silver, chlorides, and sulphates. It is then washed with strong alcohol, absolute alcohol, and ether, and then burned in a crucible; the metallic silver is then dissolved in strong nitric acid, and estimated by Volhard's method of titration. Since the quantity of silver is small, a very weak solution of ammonium sulphocyanide should be employed; 1 c.c. of my solution equalled 0.00223 of silver. From the quantity of silver the bases are then calculated by the factor 0.7381, which is derived from the molecular relations in the compounds of the silver with the several bases. This excellent method gives reliable results.

I wish again to emphasize the fact that, except when otherwise stated, tea, coffee, cocoa, chocolate, and alcoholic beverages were excluded from the diet.

Period I. A mixed normal diet, with the avoidance of sweetbreads, liver, and brains. I am naturally a rather heavy eater of proteids and fats. The results are tabulated as follows:

Day	Urine.	Total N.	Urea N.	Per ct.	Urea.	Uric acid.	Bases.	$\frac{+}{-}$ U. : U.	$\frac{-}{}$ U. : B.	Total N.: Purin N.
1	1420 c.c.	21.056	19.656	92.4	42.122	0.342	0 0282	123.1 : 1	12.1 : 1	171.8 : 1
2	1350 "	18.116	16.800	92.6	36.000	0.300	0.0233	120 : 1	12.8 : 1	169.3 : 1
3	1280 "	22.484	20.540	91.3	44.014	0.552	0.0189	79.5 : 1	29.2 : 1	118.3 : 1
4	1330 "	22.043	20.256	91.8	43.404	0.402	0.0344	107.9 : 1	11.6 : 1	153 : 1
5	1030 "	20.020	17.936	89.5	38.434	0.279	0.0245	137.7 : 1	11.3 : 1	200.2 : 1
6	1095 "	21.896	18.920	86.4	40.542	0.307	0.0201	132 : 1	15.2 : 1	202.7 : 1
Totals		125.615	114.108	...	244.516	2.182	0.1494			
Averages		20.936	19.018	90.8	40.752	0.364	0.0249	112 : 1	14.6 : 1	162.9 : 1

The body-weight remained constant upon this diet. Uric acid was precipitated from the urine cooled to 20° C. No albumin or sugar were present in the urine.

PERIOD II. The diet of sweetbreads. I ate three times daily one pair of sweetbreads (the thymus and the pancreas of the calf), which varied from 500 to 550 g. for the day. No other animal proteid was eaten, but bread and non-proteid vegetables were taken as in a normal diet; the diet contained about 120 g. of proteid and over 2400 calories of heat. The results are as follows:

Day	Urine.	Total N.	Urea N.	Per ct.	Urea.	Uric acid.	Bases.	+ U. : − U.	− U. : B.	Total N.: Purin N.
1	1340 c.c.	20.944	17.920	85.5	38.400	1.413	0.0154	27.1 : 1	86.1 : 1	44 : 1
2	1900 "	29.702	20.454	68.8	43.830	1.540	0.0302	28.4 : 1	50.9 : 1	56.8 : 1
3	1510 "	19.404	17.832	91.8	38.212	0.412	0.0208	92.7 : 1	19.8 : 1	135.7 : 1
4	1250 "	18.816	16.800	89.2	36.000	0.554	0.0293	65 : 1	18.8 : 1	92.2 : 1
5	1220 "	Spoiled	17.360	...	37.200	0.374	0.0287	99.7 : 1	13 : 1	
6	1260 "	18.842	16.081	85.3	34.459	0.937	0.0384	36.7 : 1	24.4 : 1	57.5 : 1
Totals		107.708 129.249[1]	106.447	...	228.101	5.230	0.1628			
Averages		21.541	17.741	82.3	38.017	0.871	0.0271	32.1 : 1	31.9 : 1	72.1 : 1

On the third day of the period diarrhœa set in and continued for three days, accompanied by anorexia, nausea, headache, malaise, and some abdominal pain. The diet was continued unchanged and no drugs were taken. During these three days the quantity of uric acid fell to less than one-third of what it was the first days. On the last day the gastro-intestinal disturbances quieted and a large quantity of uric acid was eliminated. Judging from what we know of the metabolism of nuclein-rich foods, the figures of the first two days represent what the actual effects of such a diet are. The bases were not appreciably altered. What was the explanation of the fall in the uric acid? It was not due to lack of absorption and assimilation of the sweetbreads, since the total urinary nitrogen was maintained. That it was due to a retention there is no evidence. Either the uric acid was transformed into some other substance, possibly urea, or it was eliminated by the bowel; it was not possible to determine which. No albumin or sugar were present in the urine. The symptoms closely resembled those noted in experimental adenin poisoning.

Upon this diet the urine could not hold its uric acid in solution even at the body temperature. Obviously the current use of sweetbreads during convalescence from acute gout as a "light white meat" is not founded upon a knowledge of its properties. Three pounds were lost during this period, probably largely water.

PERIOD III. A heavily proteid diet. In addition to some bread, fruits, green vegetables, and non-proteid desserts, I ate for breakfast six eggs,

[1] Calculated for the last day from the average.

for luncheon and dinner each a sirloin beefsteak, and at midnight a large portion of cold roast-beef; these contained in all about 200 g. of proteid; the diet contained over 2500 calories. The results were as follows:

Day	Urine.	Total N.	Urea N.	Per ct.	Urea.	Uric acid.	Bases.	+ U. : − U.	− U. : B.	Total N.: Purin N.
1	1520 c.c.	30.244	28.224	93.3	60.480	0.492	0.0091	122.9 : 1	46.3 : 1	182.1 : 1
2	1380 "	29.380	21.592	73.5	46.267	0.307	0.0329	150.7 : 1	9.3 : 1	277.1 : 1
3	1260 "	29.410	28.252	96.0	60.540	0.351	0.0238	172.4 : 1	14.7 : 1	237.1 : 1
4	1520 "	30.324	26.656	87.9	57.120	0.462	0.0289	123.6 : 1	16 : 1	185.4 : 1
5	1840 "	32.802	30.996	94.5	66.420	0.414	0.0201	160.4 : 1	20.6 : 1	227.7 : 1
6	1930 "	31.240	29.540	94.5	63.300	0.713	0.0193	88.7 : 1	36.9 : 1	149.4 : 1
Totals		183.400	165.260	...	354.127	2.739	0.1341			
Averages		30.566	27.543	90.1	59.021	0.456	0.0223	129.3 : 1	20.4 : 1	192.4 : 1

The diet agreed perfectly, and three pounds were gained in weight. The average urinary nitrogen, over 30 g., is an index of the excess of proteid in the diet, and likewise illustrates the Pflueger law of the assimilability of proteids. It is often stated that five pounds of meat per day may be easily eaten, and that some Indians can eat ten pounds in a day I know; for myself, however, the quantity in the above diet is the maximum. No albumin or sugar were in the urine.

PERIOD IV. A purely vegetable diet, which contained no milk or eggs, nor was any animal fat used in the process of cooking. Incidentally remarked, it is the eggs, milk, and animal fats which are the salvation of so-called vegetarians; without them the diet is very bulky and also revolting. Naturally, a large quantity of pease and beans are required, to provide the necessary proteid, and they were both eaten, with large quantities of bread, three times daily, together with many other vegetables and nuts. The results were as follows:

Day	Urine.	Total N.	Urea N.	Per ct.	Urea.	Uric acid.	Bases.	+ U. : − U.	− U. : B.	Total N.: Purin N.
1	1080 c.c.	11.956	10.976	91.8	23.520	0.509	0.0165	46.2 : 1	30.8 : 1	68.7 : 1
2	1140 "	11.802	10.968	92.9	23.502	0.402	0.0157	58.4 : 1	25.6 : 1	84.9 : 1
3	1340 "	12.264	11.312	92.2	24.240	0.343	0.0230	70.6 : 1	14.9 : 1	101.3 : 1
4	1610 "	12.236	11.352	92.9	24.325	0.579	0.0256	42 : 1	22.6 : 1	60.8 : 1
5	980 "	11.382	10.248	90.0	21.960	0.504	0.0215	43.5 : 1	23.4 : 1	65.4 : 1
6	990 "	11.606	10.752	92.6	23.040	0.434	0.0148	53 : 1	29.2 : 1	77.8 : 1
Totals		71.246	65.608	...	140.587	2.771	0.1171			
Averages		11.874	10.934	92.0	23.430	0.462	0.0195	50.7 : 1	23.6 : 1	74.2 : 1

The ingestion of the maximum quantity of vegetables was not sufficient to furnish more than 12 g. of urinary nitrogen, which would correspond to about 90 g. of proteid in the diet. That this is sufficient for the needs of a body of this weight is accounted for by the fact that the diet contained an excess of carbohydrates, representing over 3000 calories, and we know that an excess of carbohydrates enables a body to economize upon its proteid metabolism. The body-weight was constant. The cooled urine at 20° C. precipitated no uric acid, which was in marked contrast to the precipitation noted in the other diets. No albumin or sugar were excreted.

PERIOD V. A milk diet. The milk was a modified milk obtained from the Walker-Gordon laboratory; 2750 c.c. were taken daily; it contained a little over 4 per cent. of proteids, 120 g. of proteids, and 6 per cent. each of sugar and fats, thus corresponding to about 2700 calories. The results were as follows:

Day	Urine.	Total N.	Urea N.	Per ct.	Urea.	Uric acid.	Bases.	$\frac{+}{U.} : \frac{-}{U.}$	$\frac{-}{U.} : B.$	Total N.: Purin N.
1	1845 c.c.	17.668	16.660	94.1	35.700	0.289	0.0088	123.5 ; 1	32.8 : 1	177.1 : 1
2	1105 "	18.424	17.792	96.5	38.125	0.250	0.0109	152.4 : 1	22.9 : 1	211.7 : 1
3	1260 "	17.724	16.408	92.5	35.160	0.236	0.0115	149 : 1	20.5 : 1	216.4 : 1
4	1210 "	18.862	17.920	95.0	38.400	0.308	Lost	124.6 : 1		
5	1330 "	17.808	16.432	92.2	35.211	0.293	0.0114	120.1 : 1	25.7 : 1	176.3 : 1
6	1110 "	17.042	16.184	94.9	34.680	0.329	0.0135	105.4 : 1	24.3 : 1	152.1 : 1
Totals[1]		107.528	101.396	...	217.276	1.705	0.0561 0.0673			
Averages		17.921	16.899	94.3	36.213	0.284	0.0112	127.5 : 1	25.3 : 1	182.6 : 1

This diet agreed perfectly in every particular. At no time was uric acid precipitated from the urine cooled to 20° C. No albumin or sugar were present in the urine.

PERIOD VI. A nitrogen-free diet. Such a diet was composed of 350 g. of pure sago, 50 g. of sugar, and 100 g. of butter per day. The sago was a manufactured product, and contained on analysis but 0.069 g. of nitogren in the daily ration. The butter contained, on an average of four analyses, 0.125 g. of nitrogen in the daily ration; the sugar contained none; thus the entire daily ration of carbonous food contained less than 0.200 g. of nitrogen; it represented over 2500 calories. This diet was fully sufficient to supply the heat of the body, but for its nitrogenous metabolism the body was thrown entirely upon its own tissues; it was to determine the actual nucleinic output under such conditions that the diet was undertaken. The results were as follows:

[1] Calculated for the last day from the average.

Day	Urine.	Total N.	Urea N.	Per ct.	Urea.	Uric acid.	Bases.	$\frac{+}{-}$ U. : U.	$\frac{-}{+}$ U. : B.	Total N.: Purin N.
1	1810 c.c.	5.432	4.116	75.7	8.820	0.307	0.0065	28.7 : 1	47.2 : 1	52.2 : 1
2	1510 "	4.578	3.916	85.5	8.391	0.401	0.0050	20.7 : 1	80.2 : 1	33.9 : 1
3	1440 "	4.102	3.560	86.7	7.627	0.241	0.0060	31.2 : 1	40.1 : 1	50 : 1
4	1560 "	4.162	3.552	85.3	7.611	0.271	0.0081	28 : 1	38.4 : 1	44.7 : 1
5	1300 "	4.228	3.276	77.4	7.020	0.227	0.0076	30.9 : 1	30 : 1	56.3 . 1
6	1310 "	3.780	3.248	85.9	6.960	0.189	0.0068	36.8 : 1	27 : 8	58.1 : 1
Totals		26.282	21.668	...	46.429	1.636	0.0400			
Averages		4.380	3.611	82.4	7.738	0.273	0.0066	28.3 : 1	41.3 : 1	47.1 : 1

About six pounds were lost during this period of eight days, during which the bowels moved but twice. The diet caused very little digestive disturbance, but toward the close of the experiment there was a distinct loss of strength. Neither sugar nor albumin appeared in the urine, which was almost colorless, and held all its uric acid in solution when cooled to 20° C.

This experiment shows how the body will economize in its nitrogenous metabolism. In the various studies of the urine during starvation the output of urinary nitrogen has usually been double that present in this experiment; obviously the carbonous food shielded the tissues to that extent. While the diet cannot be called a physiological one, the figures probably represent the minimum nitrogenous metabolism. When we compare the figures here obtained with those afforded by the heavily proteid diet, where *seven* times as much urinary nitrogen was eliminated, we perceive the wide latitude of adaptability which our nitrogenous metabolism possesses, and which is in such marked contrast to the limited range of the carbonous metabolism.

Following the period of nitrogen-free diet a long rest was taken, and the next experiment was not begun until the body had recovered the lost weight. In this period (VII.) a normal diet was taken, the same as in the first period, but with the addition of three cups of coffee per day—one large cup at breakfast and a small cup of *café noir* at luncheon and dinner. Two bottles of beer were taken daily, about 0.700 l. The results were as follows:

Day	Urine.	Total N.	Urea N.	Per ct.	Urea.	Uric acid.	Bases.	$\frac{+}{-}$ U. : U.	$\frac{-}{+}$ U. : B.	Total N.: Purin N.
1	2515 c.c.	16.908	15.682	92.7	33.604	0.703	0.0506	47.8 : 1	13.9 : 1	67.9 : 1
2	1280 "	19.908	18.312	91.9	39.240	0.793	0.0461	49.3 : 1	17.2 : 1	71.6 : 1
3	2220 "	22.284	18.396	82.5	39.420	0.666	0.0555	59.2 : 1	12 : 1	93.2 : 1
4	1560 "	22.144	19.696	88.9	42.205	0.790	0.0530	53.4 : 1	14.9 : 1	79.3 : 1
5	1290 "	22.372	20.216	90.3	43.320	0.808	0.0556	53.6 : 1	14.5 : 1	78.2 : 1
6	1280 "	21.168	19.516	92.1	41.820	0.568	0.0656	71.8 : 1	8.6 : 1	101.2 : 1
Totals		124.784	111.818	...	239.609	4.328	0.3264			
Averages		20.797	18.636	89.6	39.935	0.721	0.0544	55.4 : 1	13.2 : 1	80.9 : 1

The striking increase in the uric acid and bases is the only thing noted in the results. Since both beer and coffee entered into the diet, another period (VIII.) was carried through, in which, with the same diet and a little more coffee, no alcoholic beverage was taken. The results were as follows:

Day	Urine	Total N.	Urea N.	Per ct.	Urea.	Uric acid.	Bases.	$\frac{+}{-}$ U. : U.	$\frac{-}{+}$ U. : B.	Total N.: Purin N.
1	1590 c.c.	18.480	16.576	89.6	35.520	0.942	0.0721	37.4 : 1	13 : 1	55 : 1
2	1100 "	18.352	17.296	94.2	37.062	0.953	0.0515	38.9 : 1	18.5 : 1	55.6 : 1
3	2100 "	19.012	17.612	92.6	37.740	0.821	0.0791	45.9 : 1	10.3 : 1	63.3 : 1
4	1610 "	21.840	19.516	89.2	41.820	0.657	0.0622	63.6 : 1	10.5 : 1	91.7 : 1
5	1325 "	22.176	20.095	90.6	43.060	0.821	0.0683	52.4 : 1	12 : 1	76.1 : 1
6	1860 "	20.396	18.732	91.9	40.182	0.765	0.0578	52.9 : 1	13.2 : 1	74.9 : 1
Totals		120.256	109.827	...	235.384	4.959	0.391			
Averages		20.043	18.304	91.3	39.225	0.826	0.0651	47.4 : 1	12.6 : 1	68 : 1

The following table contains a comparative summary of the average results:

Diet..	Total N.	Urea N.	Per ct.	Urea.	Uric acid.	Bases.	$\frac{+}{U} : \frac{-}{U}$.	$\frac{-}{U.} : B.$	Total N.: Purin N.
Normal	20.936	19.018	90.8	40.752	0.364	0.0249	112 : 1	14.6 : 1	162.9 : 1
Sweetbread	21.541	17.741	82.3	38.017	0.871	0.0271	43.6 : 1	32.1 : 1	72.1 : 1
Heavy proteid	30.566	27.543	90.1	59.021	0.456	0.0223	129.3 : 1	20.4 : 1	192.4 : 1
Vegetable	11.874	10.943	92.0	23.430	0.462	0.0195	50.7 : 1	23.6 : 1	74.2 : 1
Milk	17.921	16.899	94.3	36.213	0.284	0.0112	127.5 : 1	25.3 : 1	182.6 : 1
Carbonous	4.380	3.611	82.4	7.738	0.273	0.0066	28.3 : 1	41.3 : 1	47.1 : 1
Normal, with coffee and beer	20.797	18.636	89.6	39.935	0.721	0.0544	55.4 : 1	13.2 : 1	80.9 : 1
Normal, with coffee alone	20.043	18.304	91.3	39.225	0.826	0.0651	47.4 : 1	12.6 : 1	68 : 1

SUMMARY OF RESULTS. In all the experiments, except in VI., the total urinary elimination of nitrogen corresponds with the input. This nitrogen represents the common proteid metabolism of the body, and has absolutely no constant relations to the nucleinic metabolism. This is a fact of fundamental importance. The common nitrogenous metabolism is a process of low specialization, and produces a large amount of output in the form of urea and ammonia. The nucleinic metabolism is a highly specialized process which produces a small output of uric acid and purin bases. When these distinctions are clearly understood, when we realize that each of these may be increased or decreased independent of the other, when we perceive their factive independence, we will understand how worthless are the ratios based upon a comparison of their results, as the urea-uric acid ratio. I will return to this point.

The figures for urea are very interesting, inasmuch as they differ notably from the figures commonly observed in diet experiments. The urea constitutes in my case a much higher percentage of the total nitrogen than is usual. Upon the normal diet of the first period the average was 90.8 per cent.; it fell to 82.3 per cent. upon the abnormal sweetbread diet; upon the heavily proteid diet it was 90.1 per cent.; upon the vegetable diet, 92 per cent.; it rose to 94.3 per cent. upon the milk diet, fell to 82.4 per cent upon the carbonous diet, and upon the two last diets was respectively 89.6 per cent. and 91.3 per cent. The average for the physiological diets was, therefore, 91.3 per cent. of the total nitrogen, which is about 5 per cent. above the figures usually seen. A partial explanation may lie in the fact that the total nitrogen was more than usual; in most of the work from 16 to 17 g. of nitrogen constituted the output; here the average in the physiological diets was over 20 g.; since the difference is most largely in the urea, this might explain the higher percentage. The fact, however, that the highest figure

was seen in the milk diet—94.3 per cent.—and not in the heavily proteid diet—90.1 per cent.—excludes such an explanation. The cause must lie in an individual peculiarity of metabolism; there was more urea and less ammonia and kreatinin eliminated simply because that was the habitus of the individual metabolism.

The uric acid was lowest, during the periods of a natural diet, upon the milk diet, the average being 0.284 g. per diem. It was very little less upon the carbonous diet—0.273 g.—so that these figures may be taken to represent the actual extent of essential nucleinic metabolism. Upon a normal diet (I.) the uric acid was 0.364 g. This increase over a milk diet may be conceived as the result either of the ingestion in the diet of nucleins which appear as uric acid, or of a stimulation of the nucleinic metabolism by something in the diet; the first explanation seems to-day the more probable. Upon a heavily proteid diet the uric acid rose to 0.456 g., nearly a hundred milligrammes over the quantity from a diet similar, except for the excess of proteid. Upon a purely vegetable diet the uric acid was still a little higher than upon the heavily proteid diet, 0.462 g. When we consider that in a vegetable diet we are compelled to include a large quantity of seeds (pease and beans and nuts), in order to procure the necessary proteid, and that these seeds are rich in nucleins, the high figures for uric acid are only the natural and expected results.

The average, 0.871 g., for the sweetbread diet is misleading, on account of the complication of diarrhoea during the third, fourth, and fifth days. An average of the other three days, 1 260 g., represents the output more accurately. The excess is due to the large quantity of nucleins in sweetbreads, which are eliminated as uric acid.

When coffee and beer were added to a normal diet (VII.) the uric acid rose to 0.721 g.—just double the figure seen upon a normal diet without coffee and beer (I.). This excess was probably due entirely to the fact that the nucleins in coffee and beer are eliminated in part as uric acid. Caffeine is, as we know, a purin base, and we would expect it to increase the purin bodies in the urine. In order to eliminate the factor of the beer, this was excluded in diet VIII. and a little more coffee added; the uric acid rose still higher—to 0.826 g. per diem. Apparently the beer had little influence. It is therefore apparent that in connection with the use of coffee the elimination of uric acid may be more than doubled, and that in ordinary life more than half of our uric acid may come not from our food, nor from our tissues, but from our beverages. That fact, of course, does not show in the least that those beverages are bad; it must be first shown that the uric acid which results from them is harmful.

The failure of a heavy meat diet to exaggerate the elimination of uric acid is contrary to the time-honored English theories, and yet it is

what a careful consideration would lead us to expect. Muscular tissue is not rich in nucleins, and, so far as we know, it is only from nucleins and purin compounds in the diet that uric acid can be derived dietetically. The output of uric acid upon the vegetable diet is, of course, a heretical performance, but nevertheless one in direct harmony with the nucleinic richness of the pease and beans which must form so large a part of a vegetable diet.

These figures demonstrate again the comparative (and for clinical purposes, complete) worthlessness of the urea-uric acid ratio, the sacred $\frac{+}{U} : \frac{-}{U}$ of our books. Upon a normal diet (I.) it was 112.1. Upon a sweetbread diet, where the uric acid was much increased and the urea but little affected, it was 43.6 : 1. Upon the heavily proteid diet the urea was much increased and the uric acid but little, so the ratio rose to 129.3 : 1. Upon the vegetable diet, where the uric acid was somewhat increased and the urea markedly diminished, the ratio was 50.7 : 1. Upon the milk diet, where the uric acid was low and the urea high, it was 127.5 : 1—almost identical with the ratio seen in the heavily proteid diet. Upon the nitrogen-free diet (VI.) both the uric acid and the urea were low, the latter, however, much the most, and the ratio was 28.3 : 1. This was the only experiment in which I reached the gout-ratio of Haig. In these experiments the more proteid eaten the further from the gout-ratio was the $\frac{+}{U} : \frac{-}{U}$; when no proteid was eaten the gout-ratio was attained. The ratios during the last two periods with coffee, 55.4 : 1 and 47.4 : 1, are about the normal figures usually quoted. When they are contrasted with those seen upon a normal diet, 112.1, the striking results of the coffee are seen. In view of the wide currency of Haig's views, it seems necessary to emphasize the necessary conclusions from these figures. Since we know that the urea is influenced largely by the quantity of proteid in the diet and by the proteid metabolism; that the plain proteid has little influence upon the nucleinic metabolism or the elimination of the purin compounds; and that the nucleinic metabolism and the substances which affect it, and the elimination of the purin bodies, have little effect upon the urea formation, it must follow that the urea-uric acid ratio is almost valueless, and, as a basis of pathological reasoning as it is employed in current clinical medicine, entirely worthless.

The average amount of purin bases eliminated upon a normal diet (I.) was 0.0249 g. During the sweetbread diet (II.) there was but little change, the average being 0.0271 g., a slight increase, but one of no moment. Apparently all the nucleins in this diet passed into uric acid. Upon a heavily proteid diet (III.) the average figure was 0.0223 g. per day, a slight reduction below the average of the first period, but one too small to be of any importance. Upon the vegetable diet (IV.) the average of bases fell still lower—0.0195 g.—though only to a slight

degree. I believe the averages in the first four periods represent the normal averages for these bases, and that the slight fluctuations are those connected with the normal nucleinic metabolism, and that they are too slight to have had any reference to the diet. The first decided change is seen in the figures obtained as the average for the period of milk diet (V.), 0.0112 g.—less than one-half the amount seen in the first period. Upon the carbonous diet of the next period (VI.) the bases fell still lower—to 0.0066 g. These last two averages, with the figures for the uric acid during the same periods, probably represent the absolute metabolic production of the purin substances in this particular organism. So soon as coffee and beer were added to a normal diet, as in period VII , the quantity of bases rose to 0 0544 g. per day—over twice as large as the average for the periods I., II., III., IV., five times the quantity eliminated on a milk diet, and nine times the quantity passed during period VI. of the carbonous diet. In period VIII., when the beer was withdrawn, the bases rose even a little higher—to an average of 0.0651 g. per day, or three times as much as was eliminated upon the same diet (period I.) without the coffee. Obviously caffeine (a purin base) has been eliminated as a purin base. These figures confirm the findings of Krüger and Salomon, who in the study of a hundred grammes of purin bases obtained from human urine, found that less than one-third came from the metabolism, while over two-thirds belonged to the homologous series, and were derived from xanthins ingested with the diet. In all work upon the pathological relations of the purin bodies the metabolic and the dietetic bases must be kept constantly separated.

The ratios between the uric acid and the bases are interesting but not notably valuable. During the first period this ratio was 14.6 : 1. The sweetbreads during the next period increased the uric acid, but had little effect upon the bases, so the ratio rose to 32.1 : 1. Upon the heavily proteid diet the ratio was 20.4 : 1 ; upon the vegetable diet almost the same, 23.6 : 1. Upon the milk diet the ratio was 25.3 : 1, while on the carbonous diet the ratio was 41.3 : 1. Thus we see that upon different physiological diets this ratio may vary from 14 : to 25 : 1. The excess of the bases noted during the last two periods reduced the ratio to 13.2 : and 12.6 : 1 respectively. That this ratio expresses little bearing upon the nucleinic metabolism is shown by the following comparison : During period I. the ratio was 14.6 : 1 ; during period VII. the ratio was 13.2 : 1, or almost the same ; yet during period VII. about double the amount of both uric acid and the bases was eliminated as during period I. Since certain diets and the use of certain substances may increase the elimination of both uric acid and the bases, or of uric acid alone, or of the bases alone, the simple ratio between uric acid and the bases furnishes little information relative to the nucleinic metabolism, or even to the simple excretion of the substances.

The ratios of the total nitrogen to the purin-nitrogen are subject to about the same considerations which pertained to the $\overset{+}{U} : \overline{U}$ ratio. The total nitrogen depends upon one set of conditions, the purin-nitrogen depends upon another distinct set of conditions, and a comparison of two independent functions gives little evidence of the state of either. Upon the normal diet, the heavily proteid diet, and the milk diet the ratios were not far separated—162.9 : 1, 192.4 : 1, and 182.6 : 1 respectively; yet how different the metabolism during the three periods. During the vegetable diet, and during the last two diets with coffee, the ratios were, roughly, the same—74.2 : 1, 80.9 : 1, and 68 : 1 respectively—yet how different the metabolism and the urinary excretions! The urine of the carbonous diet gave the ratio of 47.1 : 1, yet during this period the total quantity of the purin bodies was nearly as large as it was during the period of milk diet, in which the ratio was 182.6 : 1.

I trust that these considerations may in some measure emphasize in an adequate manner the distinctions between the common nitrogenous and the nucleinic metabolisms, distinctions well known to physiologists, and due largely to the work of the Kossel school. These two aspects of metabolism must be studied separately; when relations between them become established we will have occasion to use a $\overset{+}{U}$-$\overline{U}$ ratio in a proper and scientific manner, which to-day we have not.

These results are not to be viewed as anything more than physiological facts. They have, so far as I can see, no bearing upon the pathology of gout. My chief aim has been to determine, I believe for the first time by accurate methods, the influence of diets upon the elimination of the purin bases, and to learn whether any constant relationship exists between them and the uric acids.

PYOCYANEUS BACILIÆMIA.

A CRITICAL REVIEW OF THE RECORDED CASES, WITH THE REPORT OF A CASE SECONDARY TO A STAPHYLOCOCCÆMIA.

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A NUMBER of instances of systemic invasion by the bacillus pyocyaneus have been reported in the last few years, and quite an extensive literature has accumulated on the subject. It is unnecessary here to detail the entire literature, as it is so completely given in many of the recent articles. The case which forms the basis of this paper is an

instance of a general invasion by the bacillus pyocyaneus secondary to one by the staphylococcus aureus. Before giving the details of this case it may be advisable to give a sketch of what is known of the clinical course of pyocyaneus infections in general in man. This is well summed up by Lartigau, in his recent article, part of which we shall abstract.

"The clinical evolution of the infection in man resembles in a general manner the other better known forms of septicæmia and some of the acute febrile diseases. The general symptoms at the onset are those of an infectious disease—weakness, prostration, and fever. The temperature is usually high; it does not run a characteristic course. Occasionally there is pulmonary disturbance, sometimes broncho-pneumonia and pleurisy. Epistaxis has been observed, and tympanites is present, as a rule. The spleen is enlarged; the urine sometimes contains small amounts of albumin. Intestinal disturbances occur with great frequency, especially in the form of a diarrhœa which shows nothing characteristic except that, at times, the movements are more or less greenish and occasionally blood-stained. The acute enteritis may come on quickly after the onset of the disease, and persist until death, or it may disappear. In other cases it appears much later in the disease. Vomiting is frequent, and the vomited matter is sometimes bloody. Cutaneous manifestations are very frequent, and appear in the form of either bullous eruptions or petechiæ and more rarely as a papular rash. The eruption generally appears on the trunk, limbs, and scrotum, and the time of its appearance is variable, in some cases being late and in others early. Death occurs in forty-eight hours to four or five days, in a few cases later.

"The post-mortem examination shows vasomotor disturbances, focal necroses, hemorrhages, lesions of the parenchyma of the heart, liver, spleen, and kidneys. Intestinal lesions are common, and show a predilection for the small intestine. There may be superficial necrosis, diffused or circumscribed. Ulcers form in the less acute cases, but rarely involve more than the mucous membrane. There may be an acute hemorrhagic enteritis."

Charrin, in his first communication, in 1889, on experimental work on animals with the bacillus pyocyaneus, found that rabbits were more susceptible than guinea-pigs, doves, or frogs. In rabbits he distinguished four types of cases—the hyperacute, lasting twenty-four hours; the acute, two to four days; the subacute cases lasted one to three weeks, and the chronic several months. The symptoms were malaise, somnolency, convulsions, fever, diarrhœa, and albuminuria. In the chronic cases there was much loss in weight. After five days to two months the animals developed marked spastic paralysis, especially of the hind legs. The bacilli could be recovered from the bloody stools and the urine.

Pathologically there was found an enteritis, hemorrhages in the stomach and cæcum, infarctions and amyloid degeneration, occasionally contracted kidneys, and hypertrophy of the heart. All these changes except the infarcts could be produced by the intravenous injection of the culture-products, and immunity could be obtained in the same way.

The nervous symptoms described by Charrin in animals have not been noted particularly in man, except in one case reported by Jadkewitsch. This man had a chronic eczema of both legs. During ten years, at three different times, there developed suppurating ulcers, which always discharged blue pus. On each of these occasions nervous symptoms developed. The first time the suppuration lasted three months, and there developed paralysis and anæsthesia of the right arm. Five years later it lasted three weeks, and again nervous symptoms appeared which persisted for four months. After three years it returned and again lasted four months; the patient then suffered from diarrhœa, paralysis of both legs, and sensory disturbances, which spread to the scrotum, penis, and the gluteal and anal regions. The urine at that time showed pyocyaneus bacilli.

The history of our case is as follows:

W. K., aged twenty-three years, newsdealer, admitted to the Mt. Sinai Hospital, July 6, 1898.

Family History. Father died of tuberculosis; brothers and sisters are healthy.

Previous History. Has slight alcoholic habit; no tobacco habit. Two years ago he went to a dispensary for headache, and was told that he had kidney disease. Since then he has not had headache nor any other symptoms.

Present History. He has been ill for two weeks and confined to bed for the past eight days. He first suffered from headache, nausea, and constipation, which increased in severity. The nausea has become quite constant, but there is no vomiting. He has had constant fever without chills. The prostration has grown very marked. He has had indefinite pains over the heart region and in the extremities, and says that he has been getting jaundiced for the past three weeks. The stools have been yellowish and generally fluid. There has been no pain, except over the left chest. He has no sweating; there is no cardiac palpitation. His urine is dark colored, and he passes increased quantities.

Physical Examination. Muscular development is poor, and there is little adipose tissue. Skin icteric and moist. Pulse 100; arteries tortuous and sclerotic, their tension not increased. Physical examination: Lungs negative. Cardiac dulness extends from the left border of the sternum to one inch to the right of the nipple line. Auscultation negative. Liver not enlarged. There is tenderness along the free border. The spleen is obscured by tympanites. Respiration 24, pulse 100, temperature 100 to 100.2°.

July 7th. Urine acid, 1010; no albumin; no sugar. Temperature 100.8° to 102.5°. Examination of the blood shows no leucocytosis.

8th to *12th.* The temperature ranged between 98.6° and 104.5°. On

the latter date one of the veins in the left arm was aspirated and 5 c.cm. of blood used for making cultures on agar and bouillon.

13*th*. Temperature 99°. The jaundice is less marked and the abdominal pain has disappeared. The stools continue to be irregular, yellow, or clay-colored.

14*th*. Temperature 98.4° to 101°. The blood cultures show a staphylococcus which, after a few days, develops a slightly golden color.

15*th*. Temperature 99° to 102°. The jaundice has almost entirely disappeared.

17*th*. Temperature 98.6° to 100°.

18*th*. Patient allowed to be up out of bed. Temperature the same.

19*th* and 20*th*. Temperature the same. Patient complains of pain in the lower part of the left thigh, on the outer side, and examination reveals a point of tenderness in the lower part of the left vastus externus muscle. The muscle feels tense in that area.

From the 21*st* to the 26*th* the temperature varied from 98.4° to 103°. The pulse rose to 120. Examination of the blood shows white blood-cells, 5625; red blood-cells, 900,000; hæmoglobin, 20 per cent.

30*th*. Pulse 130. A distinct tender swelling, about 4 cm. in diameter, can be felt in the left vastus externus muscle. An examination of the blood shows a marked diminution in the number of the red blood-corpuscles, with a high hæmoglobin coefficient. There is great variation in the size and shape of the red cells, there being numerous megalocytes and microcytes. No nucleated reds can be found. The white blood-cells are not increased in number.

31*st*. Temperature 99.5° to 103°. Patient kept in bed. The cervical, axillary, and inguinal glands are enlarged, and there is considerable œdema about the eyes. There is tenderness of the sternum.

August 2*d*. Temperature the same; jaundice more marked. Vomited a quantity of light yellow fluid twice. Spleen enlarged to percussion; not palpable.

3*d*. Temperature 100 to 106.6°, pulse 140, respirations 40.

4*th*. Temperature 103° to 104°; frequent vomiting.

5*th*. Jaundice increasing. Temperature 107°; respirations 45; pulse 155. Vomited several times. Had a chill at 9 A.M., one at 3.30 P.M., and one at midnight. Scattered over the body are numerous small areas of blackish-brown pigment, especially on the face, neck, arms and legs. They vary in size from a pin-point to three-sixteenths of an inch in diameter. There are none on the mucous membrane. The liver is enlarged and tender. The first heart-sound is very loud, the second sound poor. In the morning a blood culture was made, using 6 c.cm. of blood. In eight hours there was a profuse growth of the bacillus pyocyaneus. In the afternoon the patient was seized with tonic convulsions, with staring, glassy eyes. The attack lasted about two minutes, and after that the body was rigid.

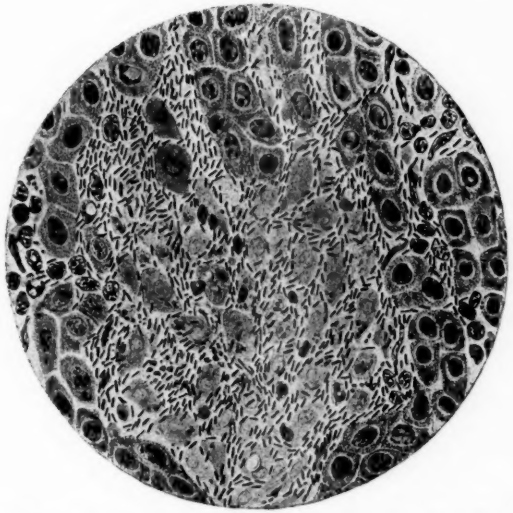
6*th*. Chill at 6 A.M., lasting ten minutes. Later the pulse became very weak, and there was some twitching of the limbs and body. He was quite rigid at intervals. The pulse rapidly became imperceptible, and the patient ceased breathing at 9 A.M., the temperature being 103.5°.

Post-mortem Examination. Made five hours after death. Mucous membranes very pale, with yellowish tint. Sclerotics yellowish. Small patches of black pigment on various parts of the body. General glandular enlargement.

Heart. Muscle fatty; left ventricle dilated; the mitral valves show some thickening of the free edge of the flaps (relative insufficiency). *Lungs* negative. *Spleen* very large; some fresh fibrin on surface; color grayish; numerous hemorrhagic spots the size of a pin-head. *Liver* very large, congested, soft; shows irregular, yellow markings, especially in the form of rings, around the vessels. *Kidneys* congested; capsules not adherent; on cut section are firm, somewhat granular, markings indistinct. *Adrenals* small; medulla looks whitish.

In the left vastus externus muscle is a small abscess, about 4 cm. in diameter, containing yellowish pus and surrounded by hard, infiltrated muscle-tissue. The other organs could not be examined.

Microscopical Examination. The liver shows intense, acute degenerative changes, with necrosis in spots; marked yellowish and brownish pigmentation. In many places the tissue cannot be recognized at all.



Zeiss objective, $^1/_{12}$ homog. immersion, ocular 6—showing marked invasion of liver by pyocyaneus bacilli.

The interstitial connective tissue is increased in amount, and there is a marked recent proliferation of round cells. The vessels are dilated, and in their walls are myriads of bacilli, which are also found packing the capillaries and lying in veritable colonies in the necrosed tissue. (See figure.) Some parts show a more marked invasion. *Spleen.* Capsule thickened; connective tissue increased. There is very intense degeneration and necrosis, and marked yellowish-brown pigmentation, especially of the more degenerated tissue. Scattered throughout the spleen are very many bacilli, which in some places are gathered in large numbers. *Kidneys.* The cells of the tubules are swollen and granular; some are desquamated, and there is much granular material in the lumen. The capillaries of the Malpighian bodies are dilated, and the

cells lining Bowman's membrane are swollen and the cells over the capillaries increased in number. The connective tissue is increased in amount and looks œdematous. There is a fairly large number of bacilli present in the interstitial tissue. *Adrenals* show intense acute degeneration, especially in the medulla; many of the cells show vacuoles; in some only an indistinct nucleus can be seen; in others it has disappeared. The vastus externus muscle shows typical changes of abscess formation.

Bacteriological Examination. Cultures from the liver, spleen and kidneys showed a very marked growth of the bacillus pyocyaneus. Cultures from the abscess in the vastus externus muscle gave a growth of staphylococcus aureus.

Post-mortem Diagnosis. Parenchymatous degeneration and necrosis of the liver and spleen; chronic interstitial nephritis; acute nephritis and degenerative atrophy of the adrenal bodies. Metastatic staphylococcus abscess of vastus externus muscle; general pyocyaneus infection.

Summary of Case. As narrated above, the patient was sick six weeks, for four weeks of which time he was in the hospital. He came in with jaundice, irregular fever, and prostration, and presented the picture of an infectious icterus. A diagnosis of septicæmia was made (with unknown portal of infection), and the blood culture, revealing the staphylococcus aureus, confirmed this view. After two weeks the jaundice had entirely disappeared, the temperature approached normal, and the patient was so much improved that he was allowed to be up. At this time his skin was of a pale lemon color, and he presented the clinical picture of a pernicious anæmia. The blood examination corroborated this. It is of interest to note the absence of any leucocytosis, although the anæmia was a secondary one. Then the patient developed symptoms of a metastatic abscess in the vastus externus muscle, and the temperature rose somewhat. Later the jaundice and other symptoms returned, and the fever became very high and the liver enlarged. A blood culture now revealed the bacillus pyocyaneus, the rapid growth pointing to a marked infection. The temperature then rose very high, and the patient died with marked nervous symptoms. The cultures made at the autopsy from the abscess showed staphylococcus aureus, confirming the first culture, made *intravitam*, and the organs all showed the bacillus pyocyaneus in enormous numbers. In short, then, we had before us a case of staphylococcæmia, with a single metastasis in a muscle—by itself a very unusual occurrence. This was then followed by the pyocyaneus invasion. The point of entry is unknown. Had a more complete autopsy been permitted it is of course possible that one might have been found. Undoubtedly the chronic nephritis predisposed the patient to bacterial invasions, and the case as a whole may in a way be considered as possibly belonging in the class of terminal infections. There are several points in connection with the case worthy of further note.

1. The great value of the blood culture in deciding the diagnosis. The case at first resembled those which have been described as due to infections by the bacillus proteus fluorescens (Weil's disease), and it is evident how important it is in these cases of infectious jaundice to examine for the infecting organism. Without the blood culture we should have been in the dark as to the diagnosis until the muscle abscess made its appearance.

2. The enormous number of bacilli in the liver and spleen, and the very marked changes found in connection with them, allow us to exclude the possibility of there having been a mere agonal invasion. (See plate.) We are inclined to believe that the pyocaneus invasion occurred at least several, probably six days, ante-mortem, when the temperature became high for the second time.

3. The pigmentation of the skin is of special interest. Various eruptions have been described in connection with infections by the bacillus pyocyaneus, mostly bullous, papular, and hemorrhagic. Our case is the first in which pigmentation such as is found in Addison's disease has been met with. We are not inclined to believe that this is due to the bacillus pyocyaneus *per se*, but to the effects of its toxins (and those of the staphylococcus) in causing the degenerative atrophy of the adrenal bodies. Such a change has been met with in connection with typical Addison's disease. Thus, Neusser (*Erkrankungen der Nebennieren*, 1897, p. 33) says: "In a large number of cases simple or inflammatory atrophy of the adrenal bodies has been advanced as the cause of Addison's disease."

4. A careful consideration of the reported cases of systemic pyocyaneus infections and of our case must bring up the question whether these infections are ever primary. This is a question which is very difficult of solution. A very large number of the cases reported occurred secondarily to or at the same time with an infection by other bacteria, or toward the end of some chronic disease. It is possible that many of the cases which are recorded as pure infections were not such, and that they followed an infection by some other micro-organism, which was then overgrown or displaced. This is especially probable, as in practically all the reported cases the bacteriological examination was first made late in the disease or at the post-mortem examination.

5. If we look over the literature up to date we find that all the cases in which the bacillus pyocyaneus has been found can be arranged in three classes.

A. *Those in which the bacillus was found during life or post-mortem in the gastro-intestinal canal, or in abscesses or exudates having a direct or indirect communication with the open air.* These cases are very numerous; thus, it has been found in skin eruptions, fistula in ano, in the discharge of otitis media cases, in the urine, in dysentery, in chronic

mastitis, in abscesses of the ovaries, etc. In these cases the infection occurred from outside the body.

B. *Those in which it was found during life in abscesses or exudates not in direct communication with the open air.* These cases are the following: Ernst isolated a variety of pyocyaneus from an exudate in the pericardium by tapping; the tubercle bacillus was also present. (The significance of this observation is somewhat lessened, as the fluid which was examined was removed at a second tapping done seven days after the original aspiration.)

Schürmayer found the bacilli in the exudate in a bursa in front of a knee-joint. The fluid was light yellowish in color; there was no constitutional reaction.

In this second class of cases we must think of the possibility of an infection by way of the blood or lymphatics.

C. *Those in which there is claimed to have been an undoubted general invasion by the bacillus, or, in other words, a pyocyaneus bacillæmia.* Many of the cases reported in this group are doubtful, as the bacteriological reports were made from post-mortem work. It has been repeatedly brought out of late years (particularly by Chvostek and Egger) how careful we must be to give the correct significance to the post-mortem invasions of bacteria, especially of such motile bacteria as the colon bacillus and the bacillus pyocyaneus. As Fischl well puts it: "The only way in which we can find out whether the post-mortem findings mean anything or not is to examine the organs microscopically and see if we can find a direct relation between the bacteria present in them and the changes in the tissue, so that we can judge of the age of the pathological changes and the way in which they originated." The only cases of supposed generalized pyocyaneus infections which we can accept as positive, therefore, are those in which the bacilli were found in the blood during life, or where they were found in numbers in the organs post-mortem, and seemed to stand in causative relation to the changes in those organs. Furthermore, much depends on the methods of making the blood culture. Canon, Petruschky, Stittmann, and Kühnau have shown the unreliability of cultures made from blood taken from the fingers or toes. Kühnau says the skin must be incised and the vein opened, but according to our experience it is enough to disinfect the skin thoroughly and aspirate the blood from the veins.

Few of the reported cases stand the test when judged by these criteria. Up to 1893 no case was recorded which absolutely proved the possibility of a systemic invasion by the bacillus pyocyaneus. This led Schimmelbusch to declare that although the bacillus pyocyaneus could cause local infections and resulting toxæmic conditions it could not invade the organism. Of a large number of cases reported since then only the following can be considered as at all convincing.

1. One of the two cases reported by Williams and Kenneth Cameron was in a child aged seven months. In this case no culture was made from the blood during life, but after death the capillaries of the liver, kidneys, and spleen were found blocked with minute bacilli, which cultures proved to be pyocyaneus. The organs showed parenchymatous degeneration. The autopsy was made very shortly after death.

2. Finkelstein, in a child aged three months, with a hemorrhagic diathesis, made a blood culture from a vein two days ante-mortem, using 1 c.cm. of blood. This showed bacillus pyocyaneus and the colon bacillus.

The same was found in the stools and, one-half hour post-mortem, in cultures from the blood aspirated from the heart. This is the first case in which the bacilli were found in the blood by means of culture during life, and therefore really the first undoubted case of pyocyaneus bacilliæmia.

3. Blum's case: Luetic child, aged two and one-half months. In this case, on the day before death, some blood was taken from the ear and examined microscopically. It was found to contain numerous bacilli resembling pyocyaneus, and the same were found microscopically and by culture in blood obtained from the heart one and one-half hours post-mortem. In the spleen and liver the bacilli were found in large numbers. In the kidneys but few were seen, although cultures showed a good growth. On the day before the infant died there developed a systolic murmur at the apex of the heart, and post-mortem there were found fine nodules at the free edges of the flaps of the mitral valve, and in these nodules and in the valve proper bacilli were found. By perforating the aortic flaps in a rabbit through the carotid artery and injecting, one hour later, a half c.cm. of a twenty-four hour bouillon culture intravenously, Blum succeeded in producing an endocarditis. Around the hole in the valve the edges were thickened and thrombi were attached. Microscopically there was found a growth of round cells, with bacilli present. Cultures of the heart-blood showed the bacillus pyocyaneus.[1]

4. The case of Czerny and Moser can probably be included in this group. In a child seven days old, by making cultures from the blood of the finger-tip, they found the bacillus coli communis on one day and the bacillus pyocyaneus the next day. A large number of control ex-

[1] Although we are inclined to include this case among the undoubted ones, we should like to draw attention here to a fallacy in connection with staining blood specimens for bacteria. We have found, even in concentrated watery solutions of methylene-blue and gentian violet, bacilli which resemble the pyocyaneus bacilli, but are somewhat shorter and thicker. If specimens of blood are stained with such solutions the bacilli adhere to the cover-glass even after thorough washing, and the impression might be obtained that there was a marked bacteræmia. We believe, therefore, that when reports are made of the presence of bacteria in the blood by staining methods it should always be stated whether the staining fluid was first microscopically examined and found free from bacteria or not; otherwise such observations may be misleading.

periments was made which seemed to show the reliability of the result, although, as pointed out above, such cultures are not to be considered trustworthy.

5. Our case is the second in which the pyocyaneus bacillus was found in the blood during life in such a way as to exclude all doubts. This is the first case in which this finding has been made in the adult, and clearly, therefore, contradicts the view that has been held by some that systemic invasion of the bacillus pyocyaneus is limited to very early life.

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CASE OF PRIMARY HEMORRHAGIC EFFUSIONS INTO THE PLEURÆ AND PERITONEUM.

By William S. Cheesman, M.D.,
of Auburn, N. Y.,
and
William S. Ely, M.D.,
of Rochester, N. Y.

Report by Dr. Cheesman: In November, 1890, the patient, a woman aged forty-seven years, became aware of oppression of breathing, without pain or cough. In January, 1891, she consulted Drs. Ely and Stoddard, of Rochester, N. Y., who found the right side of the chest full of fluid. Aspiration on March 3, 1891, of fluid deeply blood-stained. On May 5, 1891, aspiration repeated, the same fluid being obtained.

She came under my care in June, 1891. She was of a remarkably vigorous stock, had one child, and always enjoyed exceptionally good health, except for menorrhagia and pain at the menses. Fibroid of the uterus had been diagnosticated some years previously, and its presence was confirmed by me. The uterus rose nearly to the umbilicus, but, barring the monthly hemorrhage, this caused no trouble.

Examination of the chest showed fluid in the right pleura. Left side normal. Heart and urine normal.

The right pleura rapidly refilled, and on July 10, 1891, I aspirated. On this as on every subsequent occasion, full precautions against infection of the pleura were taken. Their efficacy is attested by the subsequent history. Fluid was allowed to flow till the patient experienced a sense of constriction, or coughed, when the needle was withdrawn. The

amount of fluid obtained was from two to three pints. It had always the same characters, was odorless, opaque, darkly blood-stained, non-coagulable, and on standing deposited a heavy precipitate, which the microscope showed to consist of blood-corpuscles. No other suspicious cells were ever discovered.

The pleura filled so fast that from July 10, 1891, to January 13, 1892, she was aspirated nineteen times. In this six months many medicines were tried, with the hope of stopping the loss of blood. She took ergot and iodine and iron and alum, and I forget what all beside. On the theory that I had to deal with a hemorrhagic pleurisy—*i. e.*, that the blood and serum were results of an inflammatory process—I tried at first, by confinement in bed, blisters, and internal absorbents, to stop the exudation, but without result. The patient did best in the open air. She never had a rise of temperature or cough, her color remained good, and she felt no discomfort except when accumulation caused dyspnœa.

But in January, 1892, it appeared that the loss of blood every ten days by the pleura and every month by the uterus was telling on her strength. Anæmia began to declare itself, though blood making went on so nearly *pari passu* with blood loss that this came slowly, and was not so pronounced as one would have expected. There had been no tendency whatever for the pleural surfaces to adhere, and when the chest was emptied one heard no friction or other sign of inflammation.

It seemed, therefore, that nothing was to be gained by further expectancy, and I decided to do what I had previously planned to do, whenever active interference seemed indicated. This was to wash the pleura free of blood, and to inject into it some substance which should excite adhesive inflammation or produce such a change in the membrane that exudation should cease. In casting about for a substance locally irritant, hæmostatic, antiseptic, and harmless if absorbed, iodine seemed most fully to meet the requirements. Accordingly, on January 15, 1892, the following operation was performed:

All utensils, tubing, needle (of large calibre), and water to be used, having been boiled several hours, and the patient's skin and operator's hands disinfected, the needle was introduced, without any form of anæsthesia, and the flow started by the aspirator. It was then continued by siphonage, the end of the tubing resting in a glass vessel on the floor. When tightness in the chest announced that the limit of safe withdrawal was reached, the lower end of the tubing was transferred (the fluid still flowing) to another glass vessel containing a quart of hot sterile water, and this being elevated above the chest of the recumbent patient, the water siphoned into the pleura. Before quite all had entered (in order to prevent admission of air), the vessel was lowered, and the water, *plus* some of the blood contents of the pleura, siphoned out again. The end of the tube was then placed in a second vessel of water and the process repeated. When, after several washings, the outflow was but slightly tinged, a quart of sterile water, containing thirty drops of tincture of iodine, which stained it a light sherry color, was siphoned into the pleura, allowed to remain some moments, and then run out again, after which a pint of Thiersch's fluid was run in and the needle withdrawn, leaving the Thiersch[1] fluid in the chest. These procedures were painless and required about two hours.

[1] Thiersch's fluid was used as an added, but unnecessary, assurance of the asepsis of the pleural cavity. In another case I would employ simply normal saline solution and iodine.

Two hours later sharp pain in the chest was felt, necessitating a hypodermic injection of morphine, and the temperature rose to 100° F., where it remained twenty-four hours. It then fell to the normal, and the reaction was over. In five days dyspnœa was felt again, and aspiration was done, the fluid coming light in color. But on March 5th (fifteen days later) aspiration was again necessary, and the fluid was found dark and bloody as of old.

The lavage had thus failed. On March 18th (about one month after the first) I repeated the washing in precisely the same manner as before, but with the important difference that after the irrigation I injected Thiersch's fluid, allowed it to escape, and then an iodine solution, containing twenty-five drops to the pint—twice as strong as at the first operation—and left half a pint of this in the chest.[1]

A reaction followed as before, with pain and a temperature of 100.5° F., and in a week fluid had returned, so that aspiration was necessary, a quart of clear, sherry-colored exudate being removed. But this terminated the trouble in the right side. No fluid ever returned there. However, a week or so after this washing dyspnœa recurred, and my surprise may be imagined when I found fluid present in the *left* pleura. Immediate aspiration removed a quart of hemorrhagic exudate precisely like that which had so long occupied the right chest. This effusion, be it observed, had occurred without chill, fever, pain, or any symptom save the mechanical one of dyspnœa.

In the succeeding three months the left pleura was aspirated seven times. It was then deemed wise to employ the lavage and iodine injection here, and on June 23, 1892, this was done just as before, except that the iodine was added to the Thiersch fluid (twelve drops to the pint), and about twelve ounces of this mixture left in. The usual reaction, with pain and rise of temperature to 100.5° F., came shortly after, and lasted three days. A slight reaccumulation of serum needed aspiration five days later, but only a pint of pale fluid was obtained.

This ended the trouble on the left side. From that time to this there has been no chest difficulty of any sort. It seems fair, therefore, to claim that the lavage and iodine injections exercised a controlling influence upon the pleural manifestations of the disease.[2]

The patient now returned to Rochester, and Dr. Ely resumed the care of the case.

Report by Dr. Ely: A period of four months ensued, in which the patient enjoyed undisturbed health. But in October, 1892, she noticed

[1] During this operation the needle plugged once, and while I was cleaning it by the stylet, the patient took a deep breath, and air whistled loudly into the thorax. Amphoric breathing and voice evidenced this accidental pneumothorax, but it was absorbed in a few days; a further instance of the surgical innocuousness of air merely.

[2] Of course, iodine has been frequently used as an injection in empyema, but its employment in hemorrhagic effusions I had not heard of at the time I used it. It was not until a research was made that its similar use by Dr. J. G. Hyndman, Cincinnati Clinic, 1877, vol xii. p. 15, was discovered. His case was one of active pleuritic inflammation, two aspirations giving exit to six and four pints of clear, coagulable fluid. A third aspiration obtained twenty-four ounces of bloody exudate. Dr. Hyndman then injected one ounce comp. solution of iodine, diluted with twelve ounces of water, and allowed it to remain five minutes. Fever persisted for a week, but recovery followed. Dr. Hyndman regarded the hemorrhage as proceeding from the tender vessels of a newly organized membrane on the pleura. Had the iodine injections failed it was my intention to use a solution of sulphate of zinc, 1 to 100, which Dieulafoy employed once with success in a case of hemorrhagic pleurisy.

for the first time some abdominal enlargement, which steadily increased till fluctuation was apparent, with moderate dyspnœa and œdema of the legs. The urine was normal. On November 9, 1892, I tapped the abdomen and withdrew seventeen pints of bloody serum, which was examined and found to be similar to that withdrawn from the chest in 1891.[1] Complete relief followed the operation. But the abdominal effusion recurred, and on December 19, 1892, I drew off thirteen pints of bloody serum. From this time, for the next five years, the operation was repeated forty-one times at varying intervals. A small trochar was used, with strict antiseptic precautions, and no local or general disturbance followed. The patient remained quiet for three hours after each operation; she would then go about as usual, never being confined to the house by the effusion or its withdrawal.

When the fluid was first removed from the abdomen, multiple fibroids were found springing from the *fundus uteri*. As they caused no inconvenience they received no treatment. Various remedies were employed to arrest the effusion, but their effect was not marked. In November, 1894, the fluid extract of *aralia hispida* (dwarf elder) was prescribed. This was taken for over two years, as the patient thought it helped her. It has been employed for chronic peritoneal dropsies.

In its later stages the disease corresponded to the climacteric period, and it is noteworthy that the arrest of the effusion nearly coincided with the cessation of menstruation. The last tapping was on September 11, 1897, and the final menstrual period was on March 10, 1898. Since the last tapping the patient has remained perfectly well, and as twenty months have elapsed with no recurrence of the abdominal effusion, I think that complete recovery has occurred.

The following summary of the tappings may be of interest:

Year.	No. of tappings.	No. of pints removed	Largest No. at one tapping.	Smallest No. at one tapping.	Longest interval.	Shortest interval.
1892	2	30	17	13	39 days	39 days
1893	10	83½	11	3½	49 "	24 "
1894	11	62½	8	4	41 "	21 "
1895	10	44	7	3	43 "	27 "
1896	6	31½	9	3½	59 "	36 "
1897	4	27½	12	3	121 "	28 "

Summary by Dr. Cheesman: Here, then, was a woman enjoying good health, except for hemorrhagic effusions, which, driven successively from the right and left pleural cavities, recur in the peritoneum, finally, after six and a half years, to disappear at the menopause. How shall this clinical picture be accounted for?

[1] This fluid, of which Dr. Ely sent me a specimen, exactly resembled that drawn from the chest. I sent it to Dr. Wm. H. Welch, of Johns Hopkins University, who kindly examined it microscopically and bacteriologically, and made inoculation tests. But no light was thrown thereby on the causation —W. S. C.

Zahn[1] has suggested thrombosis of the vena azygos as a possible cause of double pleural effusions, passive hyperæmia and blood leakage ensuing from the obstruction. It is not clear, however, from the report of his case that damming of the azygos was the cause of the effusion, and in his experiments on rabbits stoppage of the azygos failed to be followed by bloody effusion of the pleura. At any rate, this could not produce a peritoneal effusion also.

Manifestly, also, no simple inflammatory process covers all the facts. Hemorrhagic effusion accompanies simple pleuritis in one of two ways: either the intensity of the process leads to local stasis, with rupture of arterioles, or diapedesis of red corpuscles without rupture; or else the exudation membrane becomes organized, and its young vessels give way, as in *pachymeningitis hemorrhagica*. These cases might be appropriately termed *pachypleuritis hemorrhagica*. In them one or two aspirations often suffice to cure. The acutely inflamed and exuding membranes are thereby brought in contact, adhere, and obliterate the pleural cavity. Many such experiences are reported. In our case, however, there was no rise of temperature, pain, or cough, and when the effusion had been removed by aspiration, no friction sound indicated the presence of neomembrane or rough surface; while the unannounced transference to the peritoneum remains unexplained on this theory.

One of the commoner causes of hemorrhagic effusion into the serous sacs is tuberculosis. Indeed, some hold that every hemorrhagic pleural effusion is an expression of local tuberculosis. Dieulafoy tells us this may occur in three ways: either as part of an acute general tuberculosis, or as a complication of chronic tuberculosis, or as the result of a local tuberculosis limited to the pleura. In our case the first two possibilities were never entertained. In the early months of the patient's illness, however, grave anxiety was felt lest the third condition might exist. But time has negatived that.

Cancer of the serous membranes was likewise a possibility that gave concern, and the existence of a uterine tumor seemed to bring the case into line with Lawson Tait's observations "On the Occurrence of Hemorrhagic Pleuritic Effusion in Association with Disease of the Abdomen.[2] He relates two cases.[3]

[1] Archiv f. Patholog. Anat., c. xi. pp. 345–360.

[2] Medico-Chirurgical Transactions, 1891–2, vol. lxxv.

[3] The first was a woman, aged 26 years, who had symptoms of peritonitis after confinement, the abdomen swelling enormously. Five quarts of nearly pure blood were removed by tapping, and four weeks later nearly the same quantity, one-half blood and one-half water. Both pleuræ became the seat of bloody effusion, three and a half pints being taken from one, and two and a half from the other side; then abdominal section, with discovery of ovarian cancer, and death on the third day. Autopsy showed fungating masses on the pleural surface of the diaphragm secondary to cancer in the abdomen. The second case was a single woman, aged 36 years. Abdomen greatly swollen, and a tumor felt floating in effusion and moored to the pelvis. Left pleura full; aspiration obtained six pints of blood-stained fluid. Right pleura

One exemplifies the familiar fact that malignant disease of the peritoneum and pleura may cause hemorrhagic effusions; the other, that similar bloody serosities may occur with non-malignant abdominal disease. In both cases the abdomen was the first seat of trouble, which Tait explains by the presence of ovarian disease, malignant in one case, benign in the other. Our patient had fibroid of the uterus. We cannot, however, find in this an explanation, for the pleuræ were attacked before the peritoneum. At any rate, malignant disease, like tuberculosis, is ruled out by the patient's recovery.

We have come, by a process of exclusion, to view our case as an example of what the French term primary hemorrhagic effusions, the effusion constituting the sole morbid entity. This amounts in the last analysis to a confession of ignorance, yet Dieulafoy, Chouppe, Vulpian, Rosenback, Osler, accept this pathological view, and cite rare illustrations coming under their observation. We have found no case, however, which parallels ours in its metastases, duration, and eventual recovery.

GASTRIC ULCER AT THE MASSACHUSETTS GENERAL HOSPITAL, 1888–1898.[1]

By Robert B. Greenough, M.D.,

and

Elliott P. Joslin, M.D.,

Boston.

In connection with an article by Dr. J. Collins Warren on "The Surgery of Gastric Ulcer, with the Report of a Case of Gastrolysis,"[2] the writers undertook a study of the cases of this disease which were operated upon at the Massachusetts General Hospital for the ten years 1888–1898. To supplement this investigation Dr. Warren obtained permission to make use of the medical records. It was hoped by this means to bring out the possibility and often the advisability of an operation in a much larger number of cases of ulcer. This proved to be the case, and the subject was discussed by Dr. Warren in his paper. The records, however, afforded so good an opportunity for a collection of statistics that it was suggested that a report be made on the whole

next affected and bloody fluid found. Malignant abdominal disease, with secondary pleural infection, diagnosticated, Tait refusing to operate. Effusion removed thirty times in the next year, eight to fourteen quarts being obtained each time. Tait now did abdominal section, removed a solid fibrous tumor of the right ovary, and patient recovered.

[1] Read in part before the Boston Society for Medical Improvement, April 10, 1899.

[2] Read before the Boston Society for Medical Improvement, May 16, 1898. Boston Med. and Surg. Journ., vol. cxxxix. p. 308.

subject of gastric ulcer for this period. This we have attempted to do with the help and under the direction of Dr. Warren and your President, Dr. Fitz.

The great mass of statistics on the subject of gastric ulcer is based on the results of post-mortem examinations, and is chiefly of a pathological nature. Little can be added to what Dr. Welch[1] wrote on this subject in 1885 for Pepper's *System of Medicine;* but, as only a small portion of those afflicted with this disease die during its course, it is obvious that statistics bearing on the clinical course of gastric ulcer are especially to be desired. Recently Leube[2] reported 556 cases which came under his own observation, but no such exhaustive collection has been attempted as that by Welch on the pathological side. The subsequent condition of such patients has been still less studied, and along this line there is little positive knowledge. It is with this subject—the after-history of these cases—that the present paper is chiefly concerned, since knowledge as to the results of treatment have been obtained in 114 of the 187 cases which occurred during the decade.

In the ten years 1888–1898 there entered the hospital 187 cases of gastric ulcer. These patients were about equally divided between the two hospital medical services, and this fact affords an opportunity for studying the disease under somewhat different conditions. The total number of medical patients who entered the hospital during this time was 13,097, which gives us the percentage of gastric ulcer to the total number of patients as 1.4 per cent. This result is in striking harmony with the conclusion Welch[3] draws for Europe—namely, that there are open ulcers present in 1 to 2 per cent. of persons dying from all causes. In his 32,052 autopsies, however, about 5 per cent. showed cicatrized or open ulcers, the scars being about two and one-quarter times as frequent as the open ulcer. In Lebert's[4] clinical material of 41,688 cases seen in Zurich and Breslau there were 252 cases, or only 0.64 per cent., of ulcers of the stomach.

Geographical Distribution. It is a well-known fact that the disease is more frequent in some localities than in others. Thus Berthold[5] (his and the following statistics being based on autopsies) gives 2.7 per cent. for Berlin; Nolte,[6] 1.23 per cent. for Munich; Gneiss,[7] 8.3 per cent. for Kiel and 10 per cent. for Jena, and Starck,[8] 13 per cent. for Copenhagen. We have been able to determine the comparative frequency of gastric ulcer in Baltimore, Chicago, Denver, and Boston through the

[1] Welch. Pepper's System of Medicine, 1885, vol. ii. p. 480.
[2] Leube. Beitrage Centralbl. für Chir., 1897, No. 28, p. 66.
[3] Welch. Loc. cit. [4] Lebert. Quoted by Welch, loc. cit.
[5] Berthold. Loc. cit. Ewald, Krank. des Magens., p 382.
[6] Nolte. Loc. cit. Ewald, Krank. des Magens., p. 382.
[7] Gneiss. Loc. cit. Ewa'd, Krank. des Magens., p. 382.
[8] Starck. Loc. cit. Ewald, Krank. des Magens., p. 382.

kindness of Dr. Capps, of Chicago University; Drs. McCrea and Cushing, of the Johns Hopkins Hospital, and Dr. Hobart E. Warren, of Denver University. These facts are shown in the following table:

	Medical admissions.	*Diagnosis of gastric ulcer.*
Massachusetts General Hospital, Boston	13,097	187, or 1.43 per cent..
Johns Hopkins Hospital, Baltimore	9,517	30, or 0.32 "
Cook County Hospital, Chicago	3,930	6, or 0.15 "
Arapahoe County Hospital, Denver	5,040	6, or 0.12 "

Welch claims that in general the disease is more common in northern than in southern countries, and this statement is partially confirmed by the preceding data.

v. Sohlern[1] found that ulcer was comparatively rare in a part of Russia, in the Roen Mountains, and the Bavarian Alps of Germany. He attributes this immunity to the greater amount of potassium salts in the water of those localities. A similar investigation would be of interest in this country, but it is beyond the scope of this paper.

Sex. Sex has played a prominent rôle in the minds of all in the etiology of gastric ulcer. Thus Welch found in 1699 cases that 40 per cent. were male and 60 per cent. females. Brinton[2] puts the average higher—*i. e.*, two to one—and Willigh[3] goes further yet and makes the proportion three to one. Fiedler[4] examined 2200 bodies with reference to ulcer or ulcer scars, and found 20 per cent. women to 1.5 per cent. men, which gives the proportion as fourteen to one, the highest we have found stated. With this exception the susceptibility of females to gastric ulcer compared with that of males appears far higher in Boston than elsewhere. One hundred and fifty-seven of the cases at the hospital were females and only thirty males, thus making the proportion five to one. No such disproportion exists in the total number of males and females admitted to the hospital. Indeed, the number of male admissions usually exceeds that of the female. The explanation of this great preponderance of ulcer cases in females in Boston we must leave unanswered. In the hospital, at any rate, gastric ulcer among men is a rare disease, there being but one case to 436 admitted, this being about the number of patients occurring in a single six months' service.

The importance of sex in etiology has been recognized from the earliest days, and Schröder[5] and Kuttner[6] in the last decade have called attention to gastric hemorrhage occurring at the time of the menstrual flow, especially in ulcer patients, where the mucous membrane is obviously

[1] v. Sohlern. Der Einfluss der Ernährung auf die Entstehung des Magengeschwürs. Berl. klin. Wochen., 1889, No. 13.

[2] Brinton. Fleiner, Krankheiten der Verdauungsorgane, p. 266.

[3] Willigh. Fleiner, p. 266.

[4] Fiedler. Sitzungsber. des Dresdener Vereins f. Natur u. Heilkunde, 1883, cited by Ewald, Krank. des Magens., p. 383.

[5] Schröder. Die Chirurgie des Magens, Schröder, Lindner, Kuttner. Loc. cit., p. 131.

[6] Kuttner. Loc. cit.

more sensitive. Bearing this in mind, we searched the records for cases which should show some connection between the vomiting of blood and the menstruation. In two cases the first vomiting of blood took place at the catamenia, and in two others amenorrhœa was coincident with the beginning of symptoms. There was nothing else recorded of sufficient definiteness or note to warrant mention.

Age. The age of the patients closely corresponds to what has already been written on the subject. There was no case exceptionally young or old, the two extremes being eight and sixty-seven years respectively. The ages of patients at autopsy give an incorrect idea in this regard, and, therefore, we quote Lebert's[1] statistics instead of those of Welch for comparison:

Years	5–10	10–20	20–30	30–40	40–50	50–60	60–70
Lebert	1	24	87	84	34	17	5
	9.92 per ct.		67.86 per ct.		20.24 per ct.		1.99 per ct.
Massachusetts Gen. Hosp.	1	22	109	33	13	8	1
	12.29 per ct.		75.95 per ct.		11.23 per ct.		0.53 per ct.

The average age of the male patients was 36.75 years and that of the female 27.1 years. Eleven of the male patients were under the age of thirty, and 113 of the female. This corresponds with the statistics given by Welch. Gastric ulcer thus is most common in women between the ages of twenty and thirty, and in men a decade later.

Trauma. Trauma was ascribed as the cause of the ulcer in some of our cases, but not with sufficient clearness to merit discussion.

Occupation. So much has been written of the prevalence of gastric ulcer among servant girls and cooks that we examined the records with especial reference to this point. Realizing that these classes of society are in predominance among the hospital patients, we have also calculated out the relative per cent. in which they stand to some two hundred consecutive female admissions. This is shown in the following table:

Occupation.	157 *female ulcer patients.*	216 *consecutive female admissions.*
Housework	66 per cent.	71 per cent.
Cooks	7 "	4 "
Dressmakers	11 "	8 "
Nurses and nursery maids	5 "	6 "

Though the cooks figure rather more prominently in the ulcer column than in that of the general admissions, they in reality play a very subordinate rôle in the total number of patients. Of the male patients there was but one tailor and three shoemakers, and only two of the remaining number worked in an especially warm environment. Occupation, then, so far as our statistics go, plays a very insignificant part in the causation of ulcer.

[1] Lebert. Welch, in Pepper's System of Medicine.

SYMPTOMS. There has been a growing tendency in the last few years to put the symptomatology of gastric ulcer on a firmer basis. Fitz and especially Fleiner have brought this out in their books. Disturbances of secretion and motility are facts, whereas pain and vomiting are but symptoms. Following out this idea, Fleiner has the following arrangement in his symptomatology of ulcer:

In the first place is the disturbance of secretion of the stomach, which writers now pretty generally recognize as the true basis of the other symptoms. Then comes pain, and then the disturbed motor function, including "peristaltic unrest," antiperistalsis, and vomiting under this head. The fourth symptom is hæmatemesis. In our opinion he is right in thus throwing emphasis on the disturbance of gastric secretion in ulcer. Though a stomach tube can be seldom passed, a few properly directed questions can throw much light on the activity of the stomach's secreting cells and its muscular fibres. It is in this way that we may hope to make progress in diagnosis. The order of frequency of the chief symptoms occurring in the hospital patients was as follows:

Frequency of symptoms.	*Total number of patients*, 187.
Vomiting	179 cases, or 95.7 per cent.
Pain	173 " 92.5 "
Vomiting of blood	147 " 78.6 "
Pallor	131 " 70.1 "
Tenderness	130 " 69.5 "
Constipation	123 " 65.8 "

Vomiting was the symptom most uniformly present, being absent in but four patients, and with the matter left doubtful in four others. The time of vomiting was so variable in the different patients, and in fact in the same individual, that little of value could be gleaned from the records in this regard. This is unfortunate, because the statements of authors diverge so widely on this point. Ewald[1] and Leube[2] say the vomiting occurs soon after eating. Boas[3] puts it at the height of the paroxysm of pain, and Osler[4] "not for two or more hours after eating." Hemmeter does not commit himself. Thus these conflicting statements show that the time of vomiting is not a factor in diagnosis. The quantity of the vomitus is also indefinite, for one must take statements of the amount of vomitus with caution. This symptom will be further discussed under hemorrhage.

Pain. The pain was definitely located in practically all the cases, though not always confined to one special area. Thus pain was felt in the epigastrium in 144 of the 173 cases in which pain occurred as a symptom, but in only ninety-one of this number was it wholly confined to this locality. How varied was its distribution can be seen from the following table:

[1] Ewald. Loc. cit., p. 398. [2] Leube. Specielle Diagnose, I., p. 260.
[3] Boas. Spec. Diag. und Therap. der Magenkrank., II., 36. [4] Osler. Loc. cit., p. 481.

Situation of pain.

Epigastrium		91
"	and back	23
"	back and chest	2
"	" right costal border	1
"	" left hypochondrium	5
"	" right hypochondrium	2
"	and left hypochondrium	8
"	and chest	4
"	and between shoulders	2
"	and left shoulder blade	3
"	and umbilicus	1—51
	Total epigastrium and elsewhere	142

Various writers have called attention to the situation of the pain in regions not adjacent to the stomach, and the significance of this fact has not been by any means over-estimated, as our table shows. In differential diagnoses between gastric ulcer and gallstones too much dependence must not be put on the symptoms of pain in the right shoulder, for, as Brinton[1] has pointed out, pain may be situated there in ulcer. In a case of perforation of an ulcer into the lesser peritoneal cavity, recently seen by one of the writers of this article, the pain was felt at the top of both shoulders.

Attention has been called to pain in the back in gastric ulcer, and the importance of the pain elicited on pressure in this region has been insisted upon by Boas[2] as a valuable diagnostic sign. He goes so far as to say that dorsal pain on pressure is, in his experience, present in one-third of all ulcer cases. Though we are dealing with pain as described by the patient, and not with tenderness, the following table may be inserted as to a certain extent carrying out his view. Dorsal "druckschmerz" was not sought for with sufficient uniformity to be recorded, but this table would lead us to suppose that it often existed, on account of the many cases with pain in the back:

Situation of pain.

Back		1
"	and epigastrium	23
"	epigastrium and chest	2
"	and chest	1
"	epigastrium and right costal border	1
Between shoulders and epigastrium		2
Back, epigastrium, and left hypochondrium		5
"	" and right hypochondrium	2
"	right hypochondrium and right shoulder	1
Left shoulder blade and epigastrium		3—40
	Total back and elsewhere	41

In one case the pain was felt only in the back, but otherwise the symptoms presented nothing peculiar. This patient vomited blood, and blood was present in the stools, though there was no severe hemorrhage. She was fed by the rectum exclusively for six days following her

[1] Brinton. Quoted by Fleiner, p. 272.

[2] Boas. Spec. Diag. und Therap. der Magenkrankheiten, p. 38

admission, and we learn that since leaving the institution she has had a recurrence of the disease.

It is reassuring to note how few times pain occurred to the right of the median line. Six instances only of this sort came to our attention.

It is worthy of note that only three patients spoke of their pain as occurring before meals, and that only about the same number were relieved by food. As ulcer patients have a hypersecretion of the gastric juice, as a rule, we should expect this symptom to be more frequent. It may be accounted for, perhaps, in this way, that in comparison with the severity of the pain after meals that present before dropped out of mind. The pain followed the ingestion of food in 102 individuals. It was unrelated to meals in nineteen cases. In eighteen persons the pain was continuous. Usually the pain was relieved by vomiting, and several times it was lessened by pressure. Here, again, opinions differ. Osler[1] writes: "Pressure is, as a rule, grateful." Leube:[2] "By external pressure it (pain) is generally increased, very seldom relieved," while Dr. Fitz[3] agrees with both by saying: "Pressure sometimes aggravates, at other times lessens, the pain."

Pain was not felt at all in fourteen of the 187 patients, and the character of the disease in these cases is instructive. In 50 per cent. of this number the onset of the ulcer was with hemorrhage of a severe type, and three of these seven cases died, thereby, as will be seen later, constituting nearly one-half of all the fatal cases of hemorrhage. Five others also had marked hemorrhages, while the diagnosis of the disease was somewhat doubtful in the two remaining patients. Thus it appears that those cases of ulcer of the stomach in which there is no pain present, as a rule, a grave type of the disease.

Hemorrhage. Hemorrhage is considered by Osler,[4] Hemmeter,[5] and others as present in about 50 per cent. of all cases of gastric ulcer. Leube[6] met with this symptom in 46 per cent. of 556 cases. The term hemorrhage is so broad that we have divided our cases into two groups. In the first are classed all cases which vomited blood, no matter what the amount. This is the hemorrhage class of the books. In our second group we put those cases in which the loss of blood was so appreciable as to cause symptoms directly attributable to this loss. In many cases the blood-count helped in the classification.

One hundred and forty-seven of the 182 patients in which the records are available vomited blood either during their stay in the hospital or immediately preceding entrance. This gives the hospital percentage for hemorrhage as 81 per cent. This is certainly a striking difference

[1] Osler. Practice of Medicine, 1898, p. 482.
[2] Leube. Loc. cit., p. 260.
[3] Fitz. Wood and Fitz, loc. cit., p. 838.
[4] Osler. Practice of Medicine, 1898, p. 481.
[5] Hemmeter. Diseases of the Stomach, 1897, p. 476.
[6] Leube. Loc. cit.

from the usually accepted data. Possibly in the statistics of others cases from the polyclinic were made to figure, and, if so, that would account for the unusual severity of the disease at the hospital.

Eighty-six cases form our second group, and constitute the number in which the loss of blood was productive of constitutional symptoms. Thus 45 per cent. of the cases had one or more severe hemorrhages.

Hemorrhage ushered in the symptoms of ulcer nineteen times—in fifteen instances in females and in four in males. This bore no relation to the age of the individual, for the youngest of these patients was a woman, aged twenty years, and the oldest a man, aged fifty-three years, while the average age of these nineteen male and female patients, 38.2 and 28.9 years, respectively, closely corresponds to that which obtains for the whole number of patients. Fleiner discusses this question of hemorrhage as the first symptom of ulcer of the stomach, and it is to be conceded, as he says, that usually the ulcer is present long before the hemorrhage. It is possible, however, for a sudden occlusion of an artery to take place, a necrosis and autodigestion to follow, and the vessel or a neighboring one to be thus opened up, as Schell[1] recently reported.

The hemorrhage was fatal in seven cases, or 3.7 per cent., and in three of this number it was the first symptom. The fatality as regards sex is striking, as five of the thirty male patients, or 17 per cent., died from hemorrhage alone, while only two of the 157 females, or 1.27 per cent., died from this cause. (Note.—It is but fair to say that in two of the fatal cases of hemorrhage in males there was no autopsy.) It would thus seem that women can lose blood with greater impunity than men, and this is easy of belief.

The ages of the five male patients who died of hemorrhage were twenty-five, forty-seven, fifty-two, fifty-seven, and sixty, giving an average of forty-eight years to contrast with 36.75 years, the average of all male patients. The ages of the two female patients so dying were thirty-six and forty-nine, giving an average of 42.5 years to contrast with 27.1, the average age of the whole number of females.

These facts indicate in no uncertain way that the younger the individual the less probability of death from hemorrhage in gastric ulcer. Whether this is wholly due to the better recuperative power of youth or to changes in the arteries or blood remains to be seen.

Hood,[2] some years ago, called attention to the rarity of fatal cases of hemorrhage in gastric ulcer in females under thirty. In the years 1870–1890 at Guy's Hospital, London, there were sixty-six cases of hemorrhage due to gastric ulcer; and though there were twenty-nine of this number (twenty-seven females, two males) under thirty, but one

[1] Schell. Review in Arch. f. Verdauungskrank, 1898, p. 390.
[2] Hood. The Medical Society's Transactions, London, vol. xv. p. 283.

case proved fatal, and that a male. Referring to these statistics, he writes: "They . . . bring out the striking fact that during a period of twenty years at one of our largest London hospitals there has been no recorded case of fatal hemorrhage occurring in the person of a young female the subject of gastric ulcer." The same statement can be made of the Massachusetts General Hospital for the ten years 1888–1898. Perforation, on the other hand, is not limited to age or sex. Hood, therefore, suggests that hemorrhages from the stomach in anæmic young women are often not due to ulcer, and that in general the symptom receives too much attention in the diagnosis of this disease. At any rate, the above statistics allow us to agree with Hood, "That hemorrhage from the stomach in early adult female life is usually not a symptom of great gravity."

It had been our opinion, as gathered from the books, that it was not the violent hemorrhage which killed but rather the sum of repeated hemorrhages or a constant oozing from the bloodvessels. This opinion was evidently well founded, for in five of the seven fatal cases the hemorrhages were recurrent and extended over a considerable period of time, while in two only did the patients die soon after the hemorrhage, and then only in three and nine days, respectively. It is of interest to add that in these two cases hemorrhage was the first symptom, and one patient had no pain at all except for a few hours, and no especial tenderness. Gastric hemorrhage, therefore, kills by the subsequent exhaustion it entails rather than by the immediate loss of blood.

Operation was performed twice for hemorrhage, but hardly other than an untoward result could have been expected, because it is recorded of one patient before the operation, "pulse at times cannot be felt," and in the other case the surgical procedure was considered only a forlorn hope. No one hesitates at the present time to call the surgeon early for consultation in appendicitis. In typhoid fever, where perforation threatens, this is also common; in severe cases of gastric ulcer a consultation should be the rule.

The presence or absence of blood in the stools is too difficult a problem to be left to the patient to decide. Hosslin[1] says that a hemorrhage arising in the stomach only gives the stools the characteristic tea color when it amounts to 500 c.c. As probably but few of our gastric hemorrhages reach this amount, it is obvious how many times blood must be lost unnoticed. A microscopical examination, on the other hand, unless in the hands of experts, may only serve to give a wrong idea in the matter, since crystals of sulphide of bismuth to closely resemble hæmin crystals as to be easily mistaken for them. With these considerations in mind it is rather surprising that blood is recorded

[1] Hosslin. Münch. med. Wochensch., 1890, No. 14.

present in the stools fifty-five times. But that such data are unreliable is evident when we consider that probably most of the patients were taking bismuth and many iron at the time of the observation.

Pallor. Pallor was observed in 131 of the 164 patients in which a record of this condition was made, and was thus absent in only 20 per cent. of these cases. It is only within the latter half of the present decade that routine examinations of the blood have been made in all cases at the Massachusetts General Hospital, and our data upon this point represent only a limited number of cases. The hæmoglobin was estimated in seventy-three cases, of which thirty-four were below 50 per cent. and sixty-four below 80 per cent. This is about the proportion of cases in which pallor was noted to be present, and would establish the fact that about 80 to 85 per cent. of ulcer cases show a diminution of hæmoglobin, which accords with the view of other observers—Cabot,[1] v. Limbeck.[2] The red corpuscles were counted in forty-three cases, and in only twenty-four, or about one-half, were below four millions. This suggests a greater diminution of hæmoglobin than of corpuscles in the majority of cases, and this ratio is expressed by the "color index" of writers on the blood. The color index is the per cent. of hæmoglobin divided by the per cent. of corpuscles, and is calculated on the basis of 5,000,000 red corpuscles and 100 per cent. hæmoglobin to the normal blood. The color index in forty-three cases gave an average of 0.67, the highest being 1.41 and the lowest 0.35. In other words, as Silbermann,[3] Cabot,[4] Leube,[5] and others have pointed out, an anæmia of the chlorotic type is the rule.

The interest in this fact lies in the etiological significance of a reduced alkalinity of the blood, such as occurs in chlorotic anæmia (Silbermann, Pavy,[6] Leube), and our statistics may be considered at least suggestive in this connection four cases of the series showed indices above one. These were all young females with severe, sudden, but not fatal hemorrhages, and we are at a loss to explain the phenomenon. Cabot[7] states that "A color index above one is not met with except in pernicious anæmia." Osterspey[8] reports two cases with index above one (3,296,000 reds and 70 per cent. hæmoglobin = 1.06, and 4,048,000 reds with hæmoglobin 84 = 1.05). One of these cases was a young girl, aged eighteen years, with hemorrhage; the other a man, aged forty-eight. Cabot himself mentions one similar case, but attributes it to a mistake.

The average color index in six males was 0.64, and in thirty-seven females 0.68; no marked difference can be noted with regard to sex.

[1] Cabot. Clin. Exam. of Blood. Wm. Wood & Co., 1897.
[2] v. Limbeck. Grundriss einer klinischen Pathologie des Blutes, June, 1896.
[3] Silbermann. Zur Lehre von Ulcus Ventriculi rotundum. Deut. med. Woch., No. 29, 1886.
[4] Cabot. Loc. cit.
[5] Leube. Specielle Diagnose.
[6] Pavy. Pepper's System of Medicine.
[7] Loc. cit.
[8] Osterspey. Die Blutuntersuchungen und deren Bedeutung bei Magenkrank., Berlin, 1892.

Five of our cases showed one peculiar feature in that the hæmoglobin appeared to diminish during the first few days in the hospital without corresponding loss of corpuscles or recognized hemorrhage. This diminution of from 5 to 15 per cent. continued for from seven to ten days, and was then followed by slow recovery. The explanation may perhaps be that the dilution of the blood and formation of new corpuscles proceed more rapidly than the manufacture of new hæmoglobin.

The subjoined table will indicate the general character of the blood examinations:

Hæmoglobin, 73 cases.

20 to 30 per cent.	7	70 to 80 per cent.	8
30 " 40 "	10	80 " 90 "	5
40 " 50 "	17	90 " 100 "	3
50 " 60 "	15	100+ "	1
60 " 70 "	7		73

Red Corpuscles, 43 cases.

1 to 2 millions	6	5 to 6 millions	10
2 " 3 "	7	6 " 7 "	0
3 " 4 "	11	7 " 8 "	2
4 " 5 "	7		43

Tenderness. Tenderness has perhaps led to as many wrong diagnoses of ulcer as any one symptom. This sign has been too often elicited by leading questions on the physician's part. The Boas æsthesiometer contributed to the undue emphasis put upon it. This may partly account for the reaction which has already set in, and it is with great satisfaction to us that in the last edition of Osler that writer gives still less prominence to the subject than in his earlier edition. The symptom is most indefinite, in our opinion, and should have a small share in diagnosis. Of the 187 patients, 130 showed more or less tenderness, but the records made evident that fifty-one patients were distinctly not tender, and the matter was left in doubt six times. That tenderness was absent fifty-one times is especially suggestive, because the patients were cases in which the course of the ulcer was a severe one and the period of observation long. Hysterical symptoms are so common in chlorotic girls that the wonder is that more of them did not agree to a sensitiveness on pressure in the abdomen.

Constipation. It is not surprising that constipation occurred in 123 of the 152 cases in which notes on this matter were made, because for the most part the patients were women, and of a class of society apt to pay little attention to the rules of health.

Perforation. Perforation occurred in six, or 3.2 per cent., of the total number of cases. Four of the cases were in females, or 3.2 per cent., of the whole number of female patients. One was a male, giving 3.3 per cent. as the frequency of perforation among men. Thus no such difference exists in the sexes in perforation as does liability to

a fatal hemorrhage. Age appears to have little to do with the matter, as the females were eighteen, twenty-two, thirty, forty-one, and fifty-seven, and the one male patient was twenty-six. No perforation occurred without previous symptoms of ulcer, though in the case of a cook, aged forty-one years, there had been only very slight dyspeptic trouble for one month. In the other patients symptoms of ulcer had been present for periods varying from a few months to two and one-half years, and the complication plainly took place in an old ulcer. As a rule, when the perforation occurred it came on suddenly and left little doubt as to what had happened. All of the patients with perforation died, but one of these, a woman, aged thirty years, lived seventy days, and the autopsy revealed a parenchymatous nephritis as the direct cause of death and as coexistent a fibrinous perigastritis. This patient, in the two and one-half years preceding her entrance to the hospital, had had three attacks of hemorrhage, and whether this, as has recently been suggested, was contributory to her nephritis is a question. Certain it is, however, that on June 9, 1889, the date of the perforation, her urine was normal, but on August 18th of the same year it contained casts. On this day she had convulsions and died. For this reason in our mortality table her death is entered as perforation and parenchymatous nephritis.

The study of the perforation cases is chiefly of interest from a surgical point of view, and it has seemed worth while to tabulate these six cases for convenience:

Case.	Days between perforation and death.	Diet at time of perforation.	Operation.	Situation of perforating ulcer.	Autopsy and result.	Remarks.
E. 3	3	House diet at Convalescent Home.	Not advised by surgeon, patient moribund.	Lesser curve and posterior wall.	General peritonitis.	Convalescing at Waverly. Tonsillitis; perforation.
E. 28	15	Home. ?	Refused 24 hours after perforation.	Anterior wall.	Local abscess.	
E. 18	70	Starvation for 14 days before in M. G. H.	Not advised by surgeon.	Lesser curve.	Adhesions; no pus.	Died of nephritis.
E. 40	3	Milk in M. G. H.	0	?	No autopsy.	
W. 72	7	Liquids in M. G. H.	Six hours after perforation.	Lesser curve, anterior.	General peritonitis; no autopsy.	
W. 77	? No diag. in life.	Never starved.	0	Lesser curve, anterior.	Local abscess.	Not recognized in life as ulcer.

The situation of the ulcer is found to have been upon the lesser curvature in four cases, of which two perforated anteriorly and one posteriorly. In one case the ulcer was on the anterior wall, and in one

the situation was not known. The statistics of Welch[1] are of interest in this connection, and would seem to justify the frequency of the lesser curvature as the seat of the ulcer in our cases:

Welch. 788 *cases.*

Lesser curvature	283	36 per cent.
Posterior wall	235	29 "
Pylorus	95	12 "
Anterior wall	69	8 "
Cardia	50	6 "
Fundus	29	3.7 "
Greater curvature	27	3.4 "
	788	

The situation of the ulcer is of especial interest to the surgeon, on account of the varying results of perforation. In our six cases general peritonitis resulted twice, and in both instances the ulcer was situated on the lesser curvature, one anteriorly and one posteriorly. In two cases local abscess resulted, one where the ulcer was on the anterior wall and one where it was on the lesser curvature and perforated anteriorly. Perigastritis prevented any untoward results in one case, and in the last patient no autopsy was obtained. These facts are suggestive in that they show that the perforation into the general abdominal cavity is not the most likely result, but that adhesions may bar the spread of infection even in cases of ulcer of the anterior wall; and that in all probability the mobility of the stomach and its freedom from adhesions are the factors most important in determining the immediate results of perforation.

Another fact to be noted in our cases is that only one of them suffered perforation of the ulcer when on starvation diet, and that this one alone survived the perforation and died later of nephritis, with only a fibrinous perigastritis to mark the site of the ulcer. An operation was performed upon one case six hours after the perforation, but as the patient had been taking large quantities of liquids (℥viij. ev. 2°), a fatal result was not unexpected. In the other five cases an operation was once refused by the patient and twice by the surgeon. In one case the record is deficient, and in the last the disease was not recognized during life.

Results. Welch,[2] in his oft-quoted article, gives 85 as the percentage of cures in gastric ulcer. Leube,[3] in 1897, recorded 74 per cent. cured of 556 patients treated by himself. Ewald[4] gives 75 per cent. in an analysis of 123 hospital patients, but Debove and Remond,[5] from a study of one hundred patients, show only 50 per cent. complete cures.

[1] Welch. Pepper's System of Medicine.
[2] Welch. Loc. cit.
[3] Leube. Loc. cit.
[4] Ewald. See Lindner-Kuttner, p. 113.
[5] Debove and Remond. Cit nach Mikulicz die chirurgische Behandlung des chron. Magenschwurs. Mitteilungen aus de Grenzgeb. des Med. u. Chirurgie, 1897, Bd. ii. p. 188.

As to mortality, the figures vary between 50 per cent. (Debove and Remond) and 2 per cent. (Leube).

With these data in mind we have worked up the hospital statistics in two ways: In the first place, classifying the condition of the patients as stated in the records at the time of their discharge, and in the second place according to their state of health at the present time. We have interviewed personally or by letter the patients, their friends or employers, doctors, postmasters, city and town officials.[1] To all of these we would express our gratitude and appreciation that through them we have been able to report on 114 cases. For the sake of comparison we insert the report of the condition at discharge of 187 cases of gastric ulcer—the total number—treated at the Massachusetts General Hospital between 1888–1898:

Cured	121	64 per cent.
Relieved	34	18 "
Deaths	15	8 "
Otherwise	17	9 "

Report of the condition at discharge of 114 cases of gastric ulcer in which the subsequent condition could be determined:

At discharge		*At an average of five years later.*			
		Recurrence.	*Dead.*	*Cured.*	*Total.*
63 Cured	55 per cent.	28	8	27	63
29 Relieved	25 "	10	4	15	29
15 Deaths	13 "	...	...	...	...
7 Otherwise	6 "	3	3	1	7
114		41	15	43	99

Of the fifteen patients who died after leaving the hospital the cause was known to be gastric in eight, non-gastric in three, and doubtful in four. Revising the latter half of the last table with these facts in mind we have:

Table showing mortality and condition of 114 patients of gastric ulcer at an average period of five years after entrance to the hospital:

[1] The following letter was sent out:

BOSTON, MASS., May 6, 1898.

Dear .....

Wishing to obtain some statistics regarding the disease from which you suffered, with a view to furthering our knowledge of this affection, I take the liberty of asking you to favor me with answers to the following questions:

1. Has your health been good since leaving the hospital? Answer.
2. Have you had any pain in the region of the stomach? Answer.
3. Have you vomited? Answer.
   a. If so, how many pints at one time? Answer.
   b. Was there any blood in the material vomited? Answer.
4. Have you been constipated? Answer.
5. Have you gained or lost weight, and how many pounds? Answer.
6. Have you had eructations of gas or any other marked symptoms of dyspepsia? Answer.

A return of this paper with the desired answers in the inclosed envelope before May 12th, will greatly oblige,

Yours respectfully,

MASSACHUSETTS GENERAL HOSPITAL. J. COLLINS WARREN, M.D.

Cured 43 + 3	46	40 per cent.
Not cured—recurrence	41	36 "
deaths 15 + 8	23	20 "
deaths, cause unknown	4	4 "
	114	

The cause of death in the twenty-three instances in which it was related to the ulcer can be summarized as follows:

Deaths in the hospital—	*Males.*	*Females.*	*Total.*	*Per cent.*
Hemorrhage	5	2	7	3.7
Perforation	1	4	5	2.7
Perforation and parenchymatous nephritis	0	1	1	0.5
Exploratory laparotomy	1	0	1	0.5
Cancer[1]	1	0	1	0.5
Deaths outside the hospital—				
Gastric	1	7	8	
	9	14	23	

The mortality was therefore relatively much higher among the males than the females, being 30 per cent. in the former instance and only 9 per cent. in the latter. When one consults the literature on this point but little satisfaction is obtained. The difference is so striking, however, as to suggest a distinct variety of the disease in the two sexes. This view is enhanced by the fact that the age incidence in males is about ten years later than in females, and that hemorrhage is fourteen times as fatal in the men as in the women.

When we compare our mortality of 8 per cent. with that of Leube's of 2 per cent. it leads to deep reflections. There is no question but that the hospital dealt with a severer type of the disease, as its percentage of hemorrhage cases was 81 to his 46; yet even with this allowance, and leaving out the death by exploratory laparotomy, that by nephritis, and that by cancer, the mortality remains nearly twice as great. The more closely to bring out these differences we put the main features side by side:

	Leube.	*Mass. Gen. Hospital.*
Mortality	2.0 per cent.	8.0 per cent.
Hemorrhage	0.8 "	3.7 "
Perforation	1.2 "	2.7 "

Eighty per cent. of the patients were considered cured or relieved at the time of their discharge, but our later information shows that relief continued in but forty-six instances, or 40 per cent. Of ninety-nine patients who left the hospital we know that eight subsequently died[2] of gastric trouble, and that forty-one had a recurrence of ulcer symptoms. A recurrence, then, took place in one-half of the cases. Twelve

[1] This was a case of ulcus carcinomatosus. The patient's first hemorrhage occurred in June, 1893, and he entered the hospital for the first time on March 27, 1894. He returned August 23, 1894, and again later on, August 6th and October 25, 1895, when he finally died, and the autopsy showed that a cancer had developed about an old ulcer.

[2] Seven other patients died after leaving the hospital; in three of these the cause of death was known to be other than gastric; in four it was in doubt.

of this number, however, reported themselves well at the time of writing. Statistics on this point are not easily obtainable, and hence their significance. They point to the seriousness of an ulcer of the stomach, and if this paper does no more than to impress this fact more strongly on the profession we shall feel rewarded for our labor. It certainly is startling to realize that every other patient with gastric ulcer that one sees in the hospital is either to have a recurrence of symptoms or is never to be well again.

We had hoped to be able to estimate the number of cases which resulted in cancer and in dilatation, but the reports received are not specific enough to warrant us in drawing deductions of this nature. Ewald[1] is certainly right when he says: "Ich habe mit den Jahren diese Narbenbildungen fast noch mehr wie das primäre Ulcus fürchten gelernt."

TREATMENT. The results of treatment show that the percentage of recovery in both medical services of the hospital was the same. In one service it was the general rule to stop all food by the mouth for the first few days after entrance. On the other, this treatment was resorted to only in the severer cases, the diet being more often restricted to a small quantity of milk and lime-water for a corresponding number of days, and later on increased. The figures regarding the treatment are here given:

	Service A.	*Service B.*	*Total.*
Number of cases with no food by mouth	71	31	102
Number of cases with food by mouth	23	60	83
Doubtful	2	0	2

The average duration of the period in which the patients received food by nutrient enemata was 8.39 days, the longest period being thirty-six days and the shortest one day. We then studied these two classes of cases with reference to their condition since leaving the hospital, and thereby found the following result:

	No food by the mouth.		*With food by the mouth.*	
Cured	20	32 per cent	23	44 per cent.
Not cured	42	68 "	29	56 "
	62		52	

From these tables it would appear that only 32 per cent. of those receiving food by the mouth were cured, in contrast to 44 per cent. of cures in those patients who were given small quantities of milk and lime-water from the outset; but one must bear in mind that it was chiefly the severe cases which were put on nutrient enemata alone, and that this fact directly tended to make a less favorable showing for the starvation method. Another fact is, furthermore, of interest—namely, that the patients who were starved remained a longer time in the hospital on the average than those who were fed small amounts of

[1] Ewald. Loc. cit., p. 407.

milk and lime-water. Evidently it took longer for the former class of patients to get built up, and this was natural, for their condition was worse at entrance.

Conclusions based on the study of 187 cases of gastric ulcer occurring at the Massachusetts General Hospital, 1888–1898:

1. Gastric ulcer is more frequent in Boston than in Chicago, Baltimore, Denver, or San Francisco.

2. It is five times as common in women as in men.

3. The average age in men is thirty-seven years; in women twenty-seven.

4. Hemorrhage was present in 81 per cent. of the cases. It caused the death of 17 per cent. of the male patients, but only 1.27 per cent. of the females. No woman under thirty died of hemorrhage from gastric ulcer during this period.

5. The blood was that of a chlorotic type of anæmia.

6. Perforation occurred in 3.2 per cent. of the cases, and none of these patients left the hospital alive.

7. Of 114 patients 80 per cent. were discharged cured or relieved, but at the end of an average period of five years only 40 per cent. remained well. The mortality at the same time (due to gastric disease) was 20 per cent. Among the males it was 30 per cent., with the females 9 per cent.

8. The excessive mortality of ulcer among men, its occurrence in life a decade later than in women, and the absence of fatal cases of hemorrhage in females, point to a difference of the ulcer in the two sexes.

9. The mortality of 8 per cent., and the failure of medical treatment to effect a lasting cure in 60 per cent., of the patients indicates the need of surgical intervention in other than emergency cases of this disease.

A CASE OF TWO DISTINCT FRACTURES OCCURRING IN THE SAME PATELLA AT AN INTERVAL OF EIGHT MONTHS.

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Recently the writer was asked by a lawyer representing the plaintiff in a suit for damages against a large foundry in Philadelphia to examine the said plaintiff and appear in court as a witness in the suit then pending.

The case briefly was as follows:

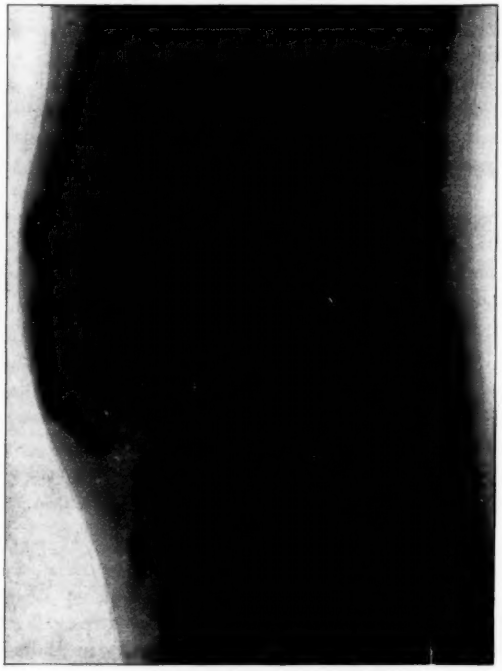
The plaintiff, while walking past the foundry on the evening of January 31, 1898, slipped on some loose fragment of bricks and fell, sustain-

ing a fracture of the left patella. These fragments of brick, he claimed, were left on the sidewalk by agents of the foundry, and on this ground he brought suit for heavy damages.

In looking up the record of his case at the Pennsylvania Hospital, in which institution he had been treated, it was found that on June 8th of the year preceding—that is, a little less than eight months before the date of his last fracture—he had sustained a previous fracture of the same patella.

As the lawyers for the defense had also engaged medical counsel, this fact could not but be known to them.

On February 7, 1899, examination of the injured knee and patella showed a truly remarkable result, when the fact of there having been two fractures in the same patella is taken into consideration; but one fracture could be made out, and in that the union was so close and firm that in the centre no separation whatever could be felt, while at the edges the separation did not exceed one quarter of an inch.



There was in addition some slight fibrous anchylosis of the knee-joint, and also some limitation of motion due to adhesions which had formed between the upper fragment of the patella and the femur.

The patella itself was much hypertrophied, measuring three and one-quarter inches in length.

At the time of the examination the patient expressed himself as confident that the two fractures had not been in the same place, and that the first one had been nearly an inch below the second. As the physical examination, however, could not discover any evidence of the existence of two fractures, this statement was ascribed to the natural anxiety of the man to make his case as strong as possible.

However, in view of the statement of Hamilton[1] in regard to the strength of ligamentous union—*i. e.*, that after five months have elapsed since the sustaining of a fracture of the patella, refracture is no more likely to take place than if the primary accident had never occurred—in view also of the reiterated statement of the patient himself, it was thought advisable to consider the probability of there being two different fractures and have an X-ray picture of the injured bone taken.

The result was surprising as well as satisfactory from the plaintiff's stand-point, as the picture unquestionably declared two separate fractures, as is shown in the accompanying figure.

The case went to trial, the X-ray was admitted and recognized as evidence, and after all the evidence on the plaintiff's side was in, a settlement was effected and damages awarded the plaintiff.

The X-ray picture certainly proved of value in this case, as it nullified what seemed to be a very strong point in favor of the defendant—namely, the contention that the plaintiff had a patella already weakened by the first accident, and as a result received an injury which in a normal individual might not have happened.

In looking up the literature of the subject but one similar case was found recorded.

It does not seem unlikely, however, that the condition may have been frequently overlooked in cases of apparent refracture, as most certainly would have been the case in this instance without the aid of the X-ray.

BRONCHIAL OBSTRUCTION BY SUPPURATING BRONCHIAL GLANDS.

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The bronchial glands and their diseases are passed over with slight mention in most of our text-books, if we except the usual statement that they become enlarged in tuberculosis and other diseases. It is certainly not common to find bronchial obstruction which may be attributed to pressure from them; yet many cases have been reported

[1] See Hamilton: Fractures and Dislocations.

in which autopsy has shown compression of the trachea or bronchi by enlarged glands, and in several cases they have softened and broken into the air-passages. The older authors—Gerhardt, Rilliet and Barthez, and Weigert—all quote instances found on the auptosy table of such perforation. Eichhorst[1] saw three cases in whch bronchostenosis followed such rupture of suppurative bronchial glands into the bronchi, presumably by cicatricial contraction. Loeb[2] reports a case in which a boy, aged four years, recently recovered from whooping-cough, died in one hour from suffocation from the presence in the trachea of a slough from a bronchial gland. By a valvular action it interfered much more with expiration than with inspiration. He tabulates fifteen other cases, dating back to 1843, in which obstruction occurred in the air-passages from a sloughing bronchial gland too large to be expectorated, as proven by autopsy in fourteen instances. In the remaining case some partially disintegrated fragments of the gland were removed by means of a catheter through the tracheotomy wound, when it was found that the operation had afforded no relief, and a still larger piece was ejected afterward. The child recovered (Petersen's case).

Poland[3] mentions a case in whch a suppurating caseous bronchial gland opened into the œsophagus and the left bronchus.

Parker[4] reports a case of sudden and fatal dyspnœa due to a bronchial gland which had ulcerated into the trachea of a child of twelve months. Nachod[5] saw a case of bronchial stenosis following the rupture of a peribronchial lymph-gland into the bronchus. Bayeux and Audion[6] have recently reported a case of perforation of the right bronchus by a caseous bronchial gland. Poupon[7] mentions a case in which a softening tuberculous gland ruptured into the trachea and right bronchus. Several other less definite references to the condition we are studying may be found, practically all in foreign journals.

We have, then, abundant pathological grounds upon which to base a diagnosis of suppurating bronchial gland, causing at first pressure upon a bronchus, and, later, upon rupture—a severe bronchitis limited to the area supplied by that bronchus, with eventual expectoration of the disintegrated gland and possibly recovery. I saw, with Dr. H. B. Whitney,[8] a case of suppuration of bronchial glands opening into the œsophagus, with complete recovery. Reports of similar cases have several times been made, chiefly by German writers. Recovery seems to be much more common in these cases, doubtless owing to the non-implication of the air-passages.

I find no record, however, excepting in Petersen's case, already quoted, of the diagnosis in a patient that recovered from the condition supposedly present in my case. In that case portions of the offending gland were recovered at the time of the tracheotomy. It is peculiarly annoying that the fleshy mass expectorated in my case could not have

been preserved for histological examination. Nevertheless, I believe the case to be of sufficient interest to merit publication. It is as follows:

X., a prominent physician of this State, aged forty-seven years, has lived in Colorado for seventeen years, and been engaged in professional work about equally distributed between in-doors and out-of-doors. There is no family history of any lung trouble. He has not had syphilis. The patient has had a winter cough for five years, and on this account went South last winter for two months, obtaining much relief. Aside from this cough he has been fairly well, and has for some years gradually increased in weight.

On October 29, 1898, he consulted me for a return of his cough, which had then lasted about six weeks. He was anxious particularly, because one examination of the sputum three years before had shown a few tubercle bacilli, although it has been repeatedly examined, with negative result, since that time. The patient appeared in excellent health, and was well developed. The chest was fuller than normal. There was some bulging above the clavicles, and the lungs reached a trifle lower than normal in the back. I have noted, however, for many years that this condition is extremely common in those who have lived long at an altitude such as that of this patient's home, about 7600 feet. The lungs were slightly hyperresonant everywhere. Over the left lung, loudest in its upper half, were many wheezing, sonorous, and sibilant râles, but no moist ones. The patient stated that he could distinctly feel that the obstruction which he noticed in breathing was entirely upon the left side and at the upper and central portion, where the râles seemed to originate. There was marked diminution in the vesicular murmur over the affected area, and diminution in voice transmission and in fremitus. The left side expanded less freely than the right upon inspiration. There was no spinal tenderness.

The signs, so suggestive of the presence of a foreign body in the left primary bronchus, led to careful inquiry as to such a possibility, but with entirely negative result. Examination of the throat by Dr. Robert Levy was practically negative. The pupils were normal, there was no tracheal tugging, the heart was negative, and in the absence of any signs except obstruction of the bronchus, aneurism of the aorta was excluded. The expectoration was scanty, and consisted of mucus. Owing to difficulty in expectoration I prescribed a cough mixture containing ammonium chloride, and directed the patient to avoid exposure to cold.

On December 3d, five weeks later, the patient returned and gave a history of gradually increasing expectoration, until, for two weeks past, it has amounted to between one and two pints daily, consisting of pure pus. His dyspnœa had been severe, and he had lost sixteen pounds in weight. The wheezing had gradually disappeared. He stated that on the preceding day, with a particularly severe cough, he expectorated a larger amount of much thicker sputum than usual, containing a comparatively firm, fleshy mass, which, unfortunately, he did not preserve for examination, since it was ejected into the flowing stream of the closet. It seemed to him that this spasm of coughing cleared up, to a great extent, the long-felt obstruction.

Since then he has breathed more easily, and the amount of the expectoration has decreased at least three-fourths, but is still abundant.

Since the last examination there has been a daily rise of temperature to about 101° F., but he has at no time been confined to bed.

Physical examination showed an entire absence of wheezing râles, while at the base of the left lung, front and back, affecting the lower two to three inches, were moderate dulness and abundant fine, moist râles, the latter being noticed especially at the end of inspiration; voice and fremitus were about normal. Right lung negative. The sputum, examined by Dr. G. H. Stover, was made up almost entirely of pus-cells, with an enormous number of staphylococci. No tubercle bacilli were found.

On December 10th the temperature was slightly subnormal at 3 P.M., pulse 59. Expectoration had practically ceased. He had coughed up two or three very small clots of blood during the past week. Absolutely no abnormal signs were to be found in the chest aside from the slight emphysema mentioned. He had resumed his work, and was in his usual health for this season of the year.

The cough becoming more troublesome in February, the patient went to Texas, as he did last year at this season. Here his cough practically ceased, and he regained one-half of the sixteen pounds which he had lost. On April 4th he had again taken up his work, coughing slightly, but was in no way worse than for five years past. His sputum at this time, examined by Dr. Stover (April 11, 1899), contains a few epithelial and pus-cells, a few staphylococci, and, less frequently, the micrococcus tetragenus. No tubercle bacilli were found.

I realize that the diagnosis in this case can be at best only a probable one, but it is of great interest to carry the differentiation as far as is possible under the circumstances. The history and the complete recovery lead us to throw out of consideration at once several conditions which may cause obstruction of a bronchus, notably aneurism of the aorta, malignant tumor affecting the bronchus, the œsophagus, the lung or neighboring parts, or the bronchial glands, as in the case reported by Landouzy and Dejèrine,[9] of melanotic disease rupturing into the left bronchus and causing death; leukæmic glandular enlargement, tumor of the thymus, Gerhardt's bronchostenosis ecchondrotica, pericardial effusion, as mentioned by Eichhorst,[10] greatly dilated left auricle (King [11]), syphilitic stenosis, stenosis from other ulcerative processes—in fact, everything excepting foreign body in the bronchus and obstruction from some cause eventually giving rise to suppuration.

Spasmodic narrowing of the trachea may occur in hysterical subjects, if we are to credit the reports of Landgraf and Gerhardt, Lublinsky, Heymann, and Chaput,[12] while M. J. Simon[13] attributes it to malarial poisoning. I am not aware of any claim that this condition may affect the bronchi, and in any event it needs only to be mentioned in this connection to be excluded.

The utter absence of history of the introduction of a foreign body from without, given as it is by a physician especially qualified to testify upon such a subject, and the recovery without expectoration of such a

body, lead me to exclude it. We have, further, the minor point that such obstruction is usually, for anatomical reasons, upon the right side. The non-expectoration of a cyst, calcareous nodule, bronchial cartilage, gallstone, renal stone, or other foreign body of internal origin, with the lack of any history pointing in this general direction, suffices for excluding this possible source of the trouble.

Of causes giving rise to suppuration, with possible emptying of pus into the bronchus, we may consider suppurating lymphatic glands, softening tuberculous glands, mediastinal abscess, and vertebral abscess.

In the absence of all signs of bone disease we exclude the latter condition. The symptoms have not been of such a degree of severity as to warrant the diagnosis of mediastinal abscess in its larger sense, and there has been no dulness or displacement of the heart such as we should expect under such conditions. It is difficult at this time to distinguish between a tuberculous softening of a bronchial gland and suppuration from the ordinary pus-producing organisms. From the known presence of a few tubercle bacilli three years ago, the frequency of tuberculosis of the bronchial glands, and the well-known tendency of such glands to soften in certain cases, we might reasonably expect to find that this case was to be explained by such a process. In connection with the winter cough of the past five winters, however, there has been abundant opportunity for infection by other germs, and a mixed infection is more probable. The absence of tubercle bacilli and the presence of abundant pus-cells and pus-producing cocci certainly suggest a pyogenic infection or a mixed one rather than a purely tuberculous process.

I believe we have by exclusion arrived at a probable diagnosis already mentioned, since no other that I can conceive of suffices to explain all of the conditions. Let us trace out the course of the case, step by step, to see how it agrees with the circumstantial evidence presented. A man who, for five winters, has had attacks of bronchitis of several months' duration, and in whose sputum tubercle bacilli were found sparingly three years ago, would probably have enlarged bronchial glands, which, from the presence of tubercle bacilli or pus-producing organisms, might well suppurate. Such glands might well account for the bronchial obstruction of October 29th. The gradually decreasing obstruction, as shown by the decrease of the wheezing from this time until December 2d (the day before the second examination), and the gradually increasing expectoration, until it amounted to more than a pint daily, we should expect, with the coincident fever, severe dyspnœa, and loss of weight, in the event of the occurrence of a slowly-oozing rupture of the suppurating focus, with gradual discharge of its contents into the bronchus and production of a local broncho-pneumonia. If a gland finally sloughed out—a process which we know is possible from the many cases quoted—

it might pass the glottis if not too large to be expectorated. Immediate relief of the remaining obstruction would be anticipated, and from this removal of the obstruction there would follow prompt improvement as regards the bronchitis, and consequent lessening of the expectoration.

Recovery would be possible if the infection had not been sufficiently severe to cause death by either of the conditions mentioned by Marfan[14] as usually fatal in such cases—namely, gangrene or abscess of lung, pneumonia, broncho-pneumonia, or pulmonary œdema. Finally, if this diagnosis be not the correct one, to what pathological conditions may we look for an explanation of the course of the disease in this case?

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A CRITICAL SUMMARY OF RECENT LITERATURE

ON

CONCUSSION OF THE SPINAL CORD, WITH SOME ORIGINAL OBSERVATIONS.[1]

(From the William Pepper Laboratory of Clinical Medicine. The Phœbe A. Hearst Foundation.)

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MUCH has been written on the subject of spinal concussion, and almost every physician has seen these cases of paraplegia in the lower limbs developing gradually after trauma. We are by no means certain that all these cases are either functional or the result of injury to the parts external to the spinal cord. I fully believe that most of them are functional, but I also believe that the proof has yet to be offered that spinal concussion does not occur in man, as it certainly seems to occur in animals.

[1] Read before the Section in General Medicine of the College of Physicians of Philadelphia, April, 1899.

Schmaus[1] has recently reviewed this entire subject, and he acknowledges that no perfectly satisfactory case of spinal concussion in man is on record. We must remember that acute fatal cases of spinal concussion in man are very rare. When death occurs early the spinal column is usually fractured or extensive intravertebral hemorrhage has formed. The changes we should expect to find in spinal concussion would be minute intramedullary hemorrhages and degeneration of nerve-fibres and nerve-cells.

As an illustration of the class of cases I have in mind I give the brief clinical history of one of my patients seen in the clinic for nervous diseases at the Polyclinic Hospital.

P. B., male, aged twenty-nine years, fell and struck the chest heavily upon the handle of a truck, and soon after this accident had difficulty in passing urine, and has since been more or less constipated. Three days after the fall, which he regarded as of little importance, he began to have dull pain in the lumbar region. He now has incomplete paraplegia of the lower limbs; the gait is slightly spastic; both knee-jerks are greatly exaggerated; ankle clonus is marked on the right side, abortive on the left; no disturbance of sensation exists in the lower limbs, and no atrophy is noticed. All venereal disease is denied.

This is a case in which spastic paraplegia, with exaggeration of the knee-jerks and ankle clonus, developed gradually after a fall which does not appear to have been very severe. It seems to me impossible to make a positive diagnosis, although I believe the case is probably one of a purely functional nature, notwithstanding the existence of ankle clonus. The subject of the post-traumatic neuroses has been recently so thoroughly discussed by Putnam[2] and others that I have nothing new to add to it.

Sometimes we find a case in which the spinal cord can with more certainty be said to be intact, notwithstanding the presence of severe symptoms. As an example, the condition of the following patient, sent to me by Dr. M. J. Stern, may be mentioned.

H. C., male, aged twenty-eight years, was struck in the left lumbar region by a mass of ice weighing two hundred and fifty pounds or more, and was knocked about twenty feet. He was not rendered unconscious by the blow, and could move the arms after the accident; he could talk and could move the right lower limb, but the left lower limb was entirely powerless, according to the patient's statement, and felt numb. He had also some difficulty in urination, but no disturbance of defecation. When I saw him he had extensive areas of ecchymosis over the

[1] Schmaus. Münchener med. Wochenschrift, January 17, 1899, No. 3. The more extensive paper by Schmaus (Ergebnisse der Allgemeinen Pathologie, etc., Lubarsch and Ostertag. Vierter Jahrgang, Wiesbaden, 1899) was received after my paper was in print. Schmaus's conclusions are the same as those published by him in January, 1899.

[2] Putnam. Journal of Nervous and Mental Disease, 1898, p. 769.

sacrum, tenderness on slight pressure to the left of the coccyx and over this bone, and this region was considerably swollen and was evidently the seat of a hæmatoma. The only area of anæsthesia was one about three inches in length and two in width, to the left of the sacrum. No anæsthesia was found in the perineum, over the external genitalia, or in the lower limbs. The knee-jerk was exaggerated on the right side but normal on the left. The man could stand, but could not walk.

The diagnosis was not as difficult as might be thought. After carefully studying the case I decided that disease of the spinal cord could probably be excluded. The man had received a very severe blow in the lumbar region, and while he was somewhat weak in his right lower limb he had much less power in his left lower extremity. If the spinal cord were involved the left half must have been much more affected than the right; and while this condition from trauma might have existed, it seemed hardly probable. The blow was received in the lumbar region, and if the cord were involved it would probably have been involved in the portion nearest the seat of injury. In the lower lumbar vertebræ only the cauda equina is present, and a unilateral lesion of the cauda would be more improbable than one of the cord, as in the latter we might have a hemorrhage limited to one side of the gray matter. Furthermore, sensation was disturbed only over the seat of the hæmatoma; the sensation of the perineum, external genitalia, and lower limbs was normal, which we should hardly expect if the cauda equina had been injured. The left knee-jerk was normal. This indicated that the left half of the lumbar region was not affected, and it was believed that a lesion above the lumbar region would probably have caused exaggeration of the knee-jerk on the left side. These were the chief considerations which led me to conclude that no organic change had occurred within the spinal cord, notwithstanding the severe injury. The hæmatoma was opened, and I am informed by Dr. Stern that the patient was dismissed improved. His later history is unknown to me.

Nonne[1] has reported a case of traumatic paraplegia which might well have been regarded as one of organic nature. Prominence of the lumbar vertebræ, pain on pressure over the vertebræ, weakness of the lower limbs, with pain and paræsthesia in these parts, exaggerated tendon reflexes, with other symptoms following a severe blow in the lumbar region, were sufficient to make a diagnosis of fracture of the vertebræ or spinal caries, developing as a result of trauma, worthy of careful consideration. The prominence disappeared under extension. As the disappearance of a gibbosity by such treatment has not been observed in traumatic spondylitis, and as spontaneous pain and pain on pressure would probably also vanish with the disappearance of the gibbosity if

[1] Nonne. Archiv für Psychiatrie, vol. xxxi. No. 3, p. 519.

the latter were due to caries, Nonne concluded, after a careful consideration of the case, that a functional disturbance would best explain the symptoms. The prominence was thought to be largely due to muscular contraction. A necropsy was obtained about two years after the accident. The spinal vertebræ and cord were found to be normal, although Nissl's method was not employed. The examination showed, according to Nonne, that the diagnosis of functional disturbance was correct.

We can expect to obtain a necropsy in a case of traumatic paraplegia without vertebral fracture or extensive hemorrhage only by the fatal termination of some intercurrent disease, and, so far as I know, no case of concussion is yet on record in which a satisfactory microscopical examination of the spinal cord of man was made a few weeks or months after the injury. Until such an examination has been accomplished the question as to the existence of spinal concussion in man cannot be regarded as settled. Nonne's case is exceedingly important, and it will doubtless be quoted as proof that spinal concussion does not occur in man; but it is possible that degeneration of nerve-fibres within the white columns of the cord occurred, even in this case, in the early days of the paraplegia, and that this degeneration was sufficient to cause impairment of function without the formation of sclerotic tissue.

The case I have to report of traumatic paralysis of the hind limbs in a cat is in evidence of the existence of spinal concussion in animals. The cells of the anterior horns of the spinal cord have been examined by the method of Nissl, or a modification of this method, in a very few cases of so-called spinal concussion. They have been studied recently by Kirchgaesser[1] and by Scagliosi.[2]

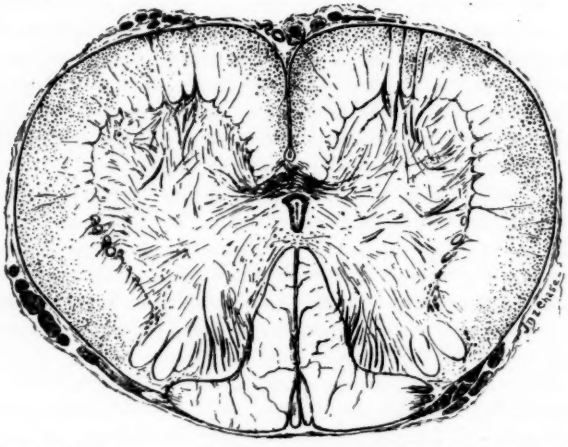
A number of writers have believed that the motor cells of the cord are diseased in certain of these cases of concussion. Kirchgaesser's investigations and my own do not support this view, although Scagliosi's are in favor of it. It must be confessed that Kirchgaesser studied the nerve-cells in only two cases and I in only one.

A kitten was caught and squeezed by a heavy swinging door on the morning of Wednesday, June 1, 1898, and died on Monday, June 6, 1898, about two o'clock in the afternoon. The spinal cord was removed about half an hour later. The box in which the animal was kept was wet during the time the kitten was in it, but no feces were seen. The functions of the bladder and rectum were probably disturbed, but of this I cannot be certain. The animal was completely unable to move the hind legs or tail, and had no sensation in these parts. I could pinch either the hind leg or the tail without causing any manifestation of discomfort or any attempt on the part of the cat to drag itself away.

[1] Kirchgaesser. Deutsche Zeitschrift für Nervenheilkunde, vol. xiii. p 422.
[2] Scagliosi. Virchow's Archiv, 1898, No. 152, p. 487.

The animal did not suffer spontaneous pain, for it played with an object held before its front paws shortly after the injury. In walking it dragged its hind limbs and tail as lifeless masses, and no voluntary motion could be observed in any of these parts.

A portion of one sciatic nerve was "teased" and placed in a 1 per cent. solution of osmic acid, but distinct degeneration could not be found. The spinal cord was hardened in formalin and later in Müller's fluid, and sections from the lumbar region were stained with acid fuschin, Delafield's and Weigert's hæmatoxylin, by the thionin method of v. Lenhossék and the Marchi method. The nerve-cells stained by thionin were almost normal. The nuclei of the cells in the lumbar region stained very intensely, and possibly the chromophilic elements were not quite so distinct as in the cervical portion of the same cord or in another spinal cord from a normal cat. Some nerve-cells in the lumbar region were distinctly altered, but these altered cells were not at all numerous. The cellular changes appeared to be unimportant. A few capillary hemorrhages were found in the pia and gray matter of the lumbar region.



The black dots in the anterior and lateral columns represent nerve fibres in an early stage of degeneration.

What was the cause of this complete paralysis of the posterior limbs after severe trauma? The vertebral column was not fractured; it contained no hemorrhages, and the macroscopic appearance of the spinal cord was normal. The sciatic nerve was intact. I had expected to find chromatolysis of the nerve-cells, but was disappointed. My results, so far as the nerve-cells were concerned, were similar to those of Kirchgaesser. The five days during which my cat lived seemed almost too

short a period for the development of degeneration detectable by the Marchi method, but in order to employ every method which might throw light on this case I stained sections from the cord by the method of Marchi.

Sections from the lumbar swelling stained by this method showed distinct degeneration in the antero-lateral columns of each side, especially marked along the periphery of the cord, in the lateral pyramidal tracts, and along the anterior fissure. (See figure.)

I have employed the method of Marchi very frequently during a number of years, and I am well aware of the errors into which one may be led if he is not on his guard. I believe, however, that these numerous black dots in this cat's cord are indicative of pathological change, because the posterior columns, the gray matter, and the lateral limiting zones of Flechsig are free from evidences of degeneration, and in the uppermost part of the lumbar region the black dots in the antero-lateral column are much less numerous than in the mid-lumbar segments.

Careful examination of these black dots shows that they are transverse sections of medullary sheaths, and a small space between them and the surrounding neuroglia may not infrequently be seen. I believe this is the earliest stage of degeneration detectable by Marchi's method, except in the manner employed by Schaffer,[1] and I am not aware that attention has been called to it. Later the black dots are not all in connection with the nerve-fibres, and lie loosely in the tissue. v. Monakow[2] mentions in his recent work that the Marchi method does not indicate the exact course of a nerve-fibre. Schaffer has found that the Marchi method does not stain nerve-fibres in which the medullary sheaths are swollen but not otherwise altered.

My investigations only in one case confirm those of Kirchgaesser, and seem to indicate that the important changes resulting from concussion are probably not within the nerve-cells so far as the Nissl stain is capable of demonstrating them; or, at least, they are not within the nerve-cells in the early stages of concussion.

My findings are not in harmony with those of Scagliosi. His experiments were performed on rabbits, and the concussion was produced by repeated blows upon the head. He found alteration of the cells of the brain and spinal cord, consisting of chromatolysis, varicose atrophy, etc.

Wagner[3] has given most of the evidence that we have regarding the occurrence of organic changes in the spinal cord of man from concussion, and he concludes his paper with the statement that the pathological condition in concussion of the spinal cord is to be found in alteration of the nerve-cells, an alteration which our methods at present do not permit us to detect.

[1] Schaffer. Neurologisches Centralblatt, 1898, p. 890.
[2] v. Monakow. Gehirnpathologie, p. 246.
[3] Wagner. Beiträge für klin. Chirurgie, 1896, vol. xvi. p. 493.

We must, of course, be cautious in applying the result obtained in experiments on animals directly to man; but as hæmatomyelia from trauma without vertebral fracture occurs in man, and as the manner in which this is produced is unknown, we may at least believe it to be possible that such changes in the essential tissues of the cord as have been observed in animals may develop in man after concussion.

Kirchgaesser has confirmed his former observations on concussion of the spinal cord of rabbits, in which he showed that considerable degeneration of the medullary sheaths, as indicated by the Marchi method, occurs after severe blows on the back without injury of the vertebræ and without hemorrhage into the vertebral canal or spinal cord.

He was able in two recently reported cases[1] to produce extensive degeneration of nerve-fibres at the region of the trauma and ascending and descending degeneration visible by Marchi's method. In some portions of the cords of these two rabbits spaces were found from which the nerve-fibres had disappeared. In one case it is distinctly stated that the vertebræ were not fractured, and that hemorrhage was not found within the vertebral column; and we may conclude that the conditions in the other case were similar. One of these rabbits was allowed to live seventeen days, the other fifteen. The degeneration of the white columns was general in the region of the spinal cord corresponding to the portion of the body to which the blows were applied, and involved endogenous as well as exogenous nerve-fibres, for it is stated that the pyramidal tracts and root-entrance zones were degenerated. No statements are made concerning the existence of hemorrhages within the cord, of round-celled infiltration, or of engorged vessels. Kirchgaesser found extensive degeneration of the posterior columns, which was not present in my case.

The cellular changes which Kirchgaesser found by the Nissl method in his two cases of concussion of the spinal cord were almost negative. If important changes had been found by this method we should hardly know how to interpret them. Goldscheider and Flatau[2] have taught us that cellular alteration is not always indicative of alteration of function. This view Nissl[3] accepts.

Soukhanoff[4] is among the most recent writers who have shown that alteration of the chromophilic elements does not necessarily imply alteration of function. He makes this statement after studying the nerve-cells of animals poisoned by arsenic.

Kirchgaesser was unable in his two experiments to observe any disturb-

[1] Loc. cit.

[2] Goldscheider and Flatau. Normale und Pathologische Anatomie der Nervenzeller, Berlin, 1898.

[3] Nissl. Münchener med. Wochenschrift, 1898, Nos. 31, 32, and 33.

[4] S. Soukhanoff. Journal de Neurologie, 1899, No. 3, p. 41.

ance of sensation. Sensation, however, was much disturbed in my cat.

In Kirchgaesser's experiments the paralysis produced by the blows upon the lumbar region disappeared after a few days, although the alteration of the cord was intense, and he believes that we cannot exclude concussion of the cord simply because paralysis does not occur at once, and that we may properly connect symptoms appearing late with a previous severe trauma.

Higier[1] has reported an interesting case of hysterical paralysis in a cat that was bitten in the back by a dog. A servant threw the cat out of a window in order to see whether it would alight on all fours. The animal, thoroughly surprised, landed on its feet and ran away, and its hysterical paralysis was cured at once. I did not attempt this heroic treatment; but hysterical paralysis in animals is probably rare, and the paralysis in my cat was doubtless organic. Death after a few days and the pathological findings support this view.

The degenerated fibres in Kirchgaesser's cases could hardly have been entirely endogenous, even though we grant the possibility of the existence of endogenous fibres within the root-entrance zones. The slight changes in the nerve-cells, as shown by Nissl's stain, indicate possibly that not all the altered fibres were endogenous. Kirchgaesser says that the cellular changes were unimportant in comparison with the alteration of the nerve-fibres. Most of the ganglion cells were normal, although some showed different degrees of chromatolysis.

It seems proper to conclude from the degeneration of fibres within the lateral columns, both in Kirchgaesser's cases and my own, that nerve-fibres may degenerate at a certain part of their course as a result of external injury, and probably may do so independently of any important alteration in the nerve-cells in which they arise. The normal condition of the cells of the spinal ganglion in tabes, as reported by Schaffer[2] after the employment of the Nissl stain, is in evidence of the same fact. Marie's[3] view that nerve-cells must be affected before nerve-fibres can become diseased, at least in systemic form, and that to accept any other theory is to show "too much honor to the nerve-fibres," is difficult to substantiate.

Alteration of nerve-cells is not always present when the axis-cylinders pertaining to these cells are diseased, and it seems to be true that to a certain extent the axis-cylinders may suffer alone. In neuritis the nerve-cells have been found normal (Soukhanoff,[4] Dejèrine[5] and

[1] Higier. Neurologisches Centralblatt, 1898.
[2] Schaffer. Neurologisches Centralblatt, 1898.
[3] Marie, Traité de Médecine, vol. vi. p. 308.
[4] Soukhanoff. Archiv de Neurologie, 1896, vol. i. p. 177.
[5] Dejèrine and Thomas. Comptes rendus de la Société de Biologie, 1897.

Thomas), although in almost all the cases of this malady in which the cells were studied they were found in a state of chromatolysis. Nissl,[1] in speaking of the changes which occur in a motor cell after its nerve-fibre is cut, says that if this reaction were the expression of loss of function of the motor nerves we could hardly understand why the cells become normal again, although the loss of function persists.

It seems probable from these statements that cellular alteration, as seen by Nissl's method, is exceedingly common after injury of the axis-cylinder, but does not invariably occur, or if it occurs may be only temporary and not of vital importance.

We have as yet no knowledge as to the condition of the neurofibrils within the nerve-cells when the axis-cylinders are cut. The extraordinary statements made by Apáthy and Bethe lead us to believe that injury of an axis-cylinder is even more likely to effect a change in the cell of origin than we had believed. In future attention will be directed toward the pathological condition of the neurofibrils. The investigations of Becker, Apáthy, Bethe, and Held indicate that important discoveries in the normal and pathological histology of the nervous system are in store for us. The statements of Apáthy and Bethe in regard to the anatomy of the central nervous system have induced Nissl[2] to say that the neuron theory can no longer exist. v. Lenhossék,[3] however, warns us that sufficient proof has not been furnished in regard to the statement that the neurofibrils are the only conducting elements for nervous impulses, and still more recently he shows that even Bethe's[4] findings do not oblige us to deny the individuality of the neuron.

[1] Loc. cit.
[2] Loc. cit.
[3] v. Lenhossék. Abstract of Bethe's paper in Neurologisches Centralblatt, 1898, No. 20, p. 944.
[4] v. Lenhossék's Neurologisches Centralblatt, 1899, No. 6, p. 242.

REVIEWS.

TRAITÉ DE MICROBIOLOGIE. By E. DUCLAUX, Director of the Pasteur Institute. Tome II. Diastases, Toxins, and Venins. Paris: Masson et Cie, 1899.

AFTER Cagniard-Latour and Schwann saw the budding of the yeast in beer-wort, and gradually the other fermentations, too, were found to be due to yeasts or moulds or bacteria, it was thought that the mystery of fermentation and putrefaction was solved, and that by simply designating them vital processes, or phenomena which were the result of life, everything was explained. As wonderful as the power of this life seemed to be, there was no thought that we could ever get beyond it. The prodigious activity of these minute organisms was studied, and science stood in amazement while contemplating the facts. A man consumes daily a quantity of food equal to about one-fiftieth of his weight, and for purposes of assimilation is unable to decompose more; the yeast of beer can break up daily from four to five times its weight of sugar, and is by no means the most powerful yeast.

Man was thought to be fastidious in his articles of diet on account of generations of training and refinement, but his epicurism was scarcely to be mentioned in comparison with that of these lowest plants.

Raulin composed for the aspergillus an artificial fluid, on which it was found the organism grew most luxuriantly and with least deviations in weight when full grown; he then withdrew different ones of the constituents of this perfect medium and studied the effect.

The medium was composed of water, sugar-candy, tartaric acid, nitrate and phosphate and sulphate of ammonia, carbonate of potassium and of magnesium, sulphate of zinc and of iron, and silicate of potassium. He found if he omitted the potassium entirely the growth of the plant was twenty-five times less, and if ammonia was withdrawn one hundred and fifty times less. But these constituents were present in the fluid in appreciable quantities; that which was remarkable was the discovery that if the zinc which was present in a dilution of one to fifty thousand was removed the growth was ten times less than in the original liquid—or, in other words, one milligramme of zinc was able to make a difference of seven hundred times that weight in the growth of the aspergillus.

It was these experiments that led Duclaux to observe, in 1884: "If we reflect that in a liquid containing only one fifty-thousandth part of zinc one or two generations of aspergillus might, by completely absorbing the metal, weaken or frustrate the existence of a new generation—that in such a liquid a fresh process of sowing (I was going to say inoculation) would be destined to fail—how is it possible not to reflect at the same time on the mysterious nature of virulent diseases, such as smallpox, scarlatina, typhoid fever, which never appear twice in the same person?"

When we looked around us after these discoveries, and were able to attribute so many of the essential phenomena of nature to life, and we made this life recognizable to the eye, it was thought that the final step had been reached and that the study of chemistry had been dethroned for that of microscopy. But what the microscopist was unable to do because his field of vision was limited to morphology the chemist has succeeded in, and he has shown us by what processes the cell accomplishes these vital phenomena, or, in other words, has indicated to us its physiology.

It has been demonstrated by Croft-Hill and others that the essential physiological functions of the cell—those which characterize it as a living being—are carried out by chemical substances which scarcely belong to it, or at least can be extracted from it, and still remain capable of acting outside the cell which produced them.

The processes of nutrition comprising the decomposition of complex molecules into simpler ones, or its opposite, the synthesis of simpler substances; the coagulation and liquefaction of substances so that they can be more easily acted upon; the respiration of the cell comprising oxidation and reduction—all are the results of diastases or enzymes or ferments within and manufactured by the cell, and which produce the same effects when excreted or otherwise separated from it.

For years chemists have been studying the diastases excreted by the cells of the digestive tract which are so essential to general nutrition; rennet, with its action of coagulation on proteids; pepsin, with its action of decomposition in an acid; trypsin in an alkaline medium; the emulsifying ferments in the bile and pancreatic juice; they even comprehended that the cause of coagulation of the blood was a ferment; but that the cells themselves carried on their infinitesimally small processes of nutrition by the same or analogous diastases of coagulation and liquefaction, of decomposition, of oxidation and reduction, remained for one day to demonstrate.

It is this knowledge that draws from Duclaux the delightful simile between the cell and the court of an Indian Rajah, with its unchanging ceremonial carried on by domestics whose number equals the special work to be done, because the duties of each are determined, and encroach upon one another only in emergencies.

As yet we can only guess at the number of different diastases. It is probable that, for instance, almost every microbic species possesses one or several peculiar to it, in order to enable it to draw its nourishment from certain predilective substances or defend itself against substances injurious to it by coagulating them so that they cannot penetrate the cell, by neutralizing them or by dissolving them.

Metschnikoff's work has proven that it is the diastases produced and excreted by the phagocyte, stimulated by the diastases from the infectious microbe, that act as the means of defense to the organism, destroying by dissolution the microbes, or neutralizing their toxin, and the apparent struggle between two living beings—the cell and the microbe—is in reality a question of antagonism between chemical substances.

Like their generators—the cells—these diastases are capable of producing effects out of all proportion to their size, and though they have not the power of reproduction, they possess its equivalent immortality, inasmuch as in favorable media they continue to cause indefinitely their effect without lessening or destroying themselves.

It is to Roux and Yersin that we owe the discovery that the active principle of diphtheria antitoxin is a diastase, and following this came the knowledge that the different microbic toxins are to be classified under the same head. Being diastases they adhere to precipitates in liquids containing them; and in the organism, or when carried in the circulation, attach themselves to cells of tissues, and can even manifest preferences toward particular kinds of cells.

Wasserman and Takaki demonstrated that the brain of a guinea-pig pounded into an emulsion with sterile water and injected in a mixture with tetanus toxin had no effect on an animal, even though very susceptible to tetanus; and Metschnikoff concluded this experiment by proving that this was not due to the presence of an antitoxin, but that the toxin was only fixed and immobilized by its adherence to the cerebral cells, in the same way as in the experiments of Roux and Yersin it had adhered to the precipitate of chalk.

It is on this epoch-making work that Duclaux formulates his definition of a microbic toxin as a diastase, which, in travelling through the organism, attacks certain cells more or less necessary to it, and shows its presence and persistence by more or less profound disturbances. If this is true, and the proof is too well substantiated to doubt it, a new era in the study of toxins and antitoxins lies before us. From the fact that the destruction of a limited number of essential cells in an organism can lead to disease or death of the organism, a new disproportion between the effect and the cause (already great in the action of diastases) is added. Duclaux asks, "What is the weight of the cells of the central nervous system or of the pneumogastric that, destroyed, will lead to cessation of the movements of respiration and, consequently, death? Probably only a few milligrammes, and if these cells were killed by the action of a diastase, this need not exceed one-thousandth of a milligramme, which then would become a fatal poison for a man of sixty kilos—that is, of 60,000 million times the weight of the substance intoxicating (about one-millionth of a grain for a man of 170 pounds)."

With such wonderful facts before us the prominence of even the ultimate cell and the microbe must give way to the importance of the different diastases, and it is consequently not to be wondered at that to this study of diastases, toxins, and venins Duclaux devotes the whole of the second volume in his *Traité de Microbiologie*. The first volume of this magnificent work appeared a little over a year ago, and is principally a text-book of bacteriology, treating of bacteriological morphology, technique, and the subjects coming naturally into such a text-book.

The third volume, which is expected at the end of the year, will treat of immunity. As was to be anticipated, this treatise on diastases, their properties, description, and classification, is carried out to the limits of our present-day knowledge. It is a recapitulation of the discoveries and work done by the scientists throughout the world, arranged into a text-book by one of the best known among them.

Duclaux's style is clear, if not always concise, and, like Herbert Spencer, his apt illustrations and way of putting an uncommon thought or a new theory or an explanation that might be obscure from several aspects make him impossible to be misunderstood. If we are to judge the work from the two volumes already published, it will be an acquisition to medicine of which the whole world may be proud. J. W.

CYCLOPÆDIA OF THE DISEASES OF CHILDREN. Supplemental volume. Edited by M. A. EDWARDS, M.D. 8vo. Pp. 1332. Philadelphia: J. B. Lippincott & Co.

UP to the time of the issuing of the *Cyclopædia of the Diseases of Children* there had not appeared—nor, indeed, has there since appeared—any work devoted to pediatrics published in English so great in its conception and splendid in its execution. In fact, the publication stands alone—a memorial to the ability of the lamented Keating. It is a question whether it is not better to let such classical works be. Attempts to supplement them in any way by later writings are generally ill-advised. They mar instead of make.

There seems to have been a great lack of uniformity followed by the contributors in the construction of the articles. In some cases the effort has been made merely to supplement the original article, adding what is new and changing what is old and incorrect. This is commendable. In too many instances the authors have made their writings seemingly too complete, giving definitions and details of causes, symptoms, and pathology. This is unnecessary and a burden to the reader, since these are, for the most part, to be found in the original articles. In other instances the contributors have entirely reconstructed the original article, which is a good plan where they were the original authors. In still other cases the reader is left in some doubt whether the article is a supplement or a substitute, and he is consequently uncertain how much of the original he is still to accept as true. To some articles has been added an extensive bibliography of the past ten years, while in others only a few names are mentioned in the text, and one wonders whether or not there are others. Finally, we cannot tell whether we are to infer, because a disease is not mentioned—as, for instance, the whole class of diseases of the mouth—that there has been nothing new written on the subject in the last ten years.

Facts like these illustrate the difficulties which attend the construction of supplemental volumes, and confirm us in the feeling that the original works are seldom improved and often injured by them. Yet we fully appreciate the desire of the editor and publisher to bring the *Cyclopædia* up to date, and we admire the degree of success attained; for, after all, the volume is an excllent one—as good in most respects as can be expected with these difficulties to be met.

There are ninety-five separate sections, contributed by almost as many different writers. A number have been made by the original contributors; many have not.

We note at the outset a valuable article by Ballantyne upon Congenital Diseases and Diseases of the New-born. The paper on the Therapeutics of Children, by Hare, badly needs some detailed reference to the tolerance or intolerance of various drugs in early life. There was nothing regarding this important and practical matter in the original article by Bartholow, and a great opportunity has been missed in this supplement. The contribution on Mortality in Early Life appears to be a short sketch of the mortality in New York City—hardly sufficient for a general work of this kind.

Rotch's paper on Feeding in Infancy is an able supplement to his earlier contribution—thorough, careful, and elaborate, as his writings always are.

The section on Typhoid Fever hardly represents our present knowledge of the frequency of this disease in infancy and childhood. Experience has abundantly proven that it is not so rare in the first two years of life as the author states. A brief review of the literature of the last ten years shows this quite well.

J. Lewis Smith's paper on Diphtheria was one of the best in the *Cyclopædia*, and Lennox Browne's supplement is satisfactory in every respect save one—viz., the writer's attack upon the serum treatment. Argument of any sort is out of place in a cyclopædia of this nature, in which the writer is expected to give less of his own opinion and more of the accepted views of leading authorities in general, with a careful weighing and balancing of these. But in this contribution many pages are wasted in argument, often somewhat sophistical and never convincing, against the widely accepted opinions of the value of antitoxin. The vast collections of statistics in favor of it have been almost wholly ignored, and the statements are based upon the results in a single hospital. Whatever the value of the treatment may be, this method of discussing it is far from judicial.

The section on Rheumatism, by Cheadle, is an excellent, moderate article which fairly presents the various theories of the etiology of the disease, while distinctly supporting the view of its infectious nature.

In the section on Tuberculosis, by Blumer, we should like to have seen some more extended discussion of the relative frequency of the entrance of the bacilli through the lungs and the digestive tract respectively. The matter is referred to later in an excellent contribution by Jacobi on Pulmonary Tuberculosis.

The articles on Scurvy and on Cretinism are contributed respectively by masters of the subjects—Barlow and Osler. The italicised statement that there is in scurvy no characteristic affection of the gums unless teeth have appeared is true only with exceptions, as the statistics of the American Pediatric Society's collective investigations have clearly shown.

We regret to see introduced into this volume the use of the rather antiquated term "mucus disease" as the heading of a section. The conception of this condition as an entity has been abandoned by practically all the best modern writers. Confusion, too, is produced by the application of the term to an entirely different condition in the main body of the *Cyclopædia*.

Ashhurst's advice to operate in intussusception after four to six days of medical treatment is too conservatively dangerous to represent the most widely accepted views.

The article upon Appendicitis is excellent, but something more definite about the disease as seen in children would have been of advantage; and it would be discouraging to see the diagnosis written of as so easy did we not know that many surgeons of very wide experience do not find it so.

The section on Diseases of the Liver, by Musser, is one of the most praiseworthy of the volume. It is an excellent appendix to his original article.

W. A. Edwards contributes an excellent section on Diseases of the Uterus, Vagina, and Vulva, and H. A. Kelly one equally good on Diseases of the Ovaries and Fallopian Tubes.

The article on Fractures and Dislocations is stated to be a résumé of the cases reported in the last ten years. The author begins by referring

to only two cases of fragilitas ossium, whereas we know that probably a dozen have been reported during this period. It is possible that the literature of the balance of the article is more complete.

Finally, in the department of Nervous Diseases, we notice excellent papers by Mills, Sachs, Collins, Nancrede, Putnam, and others.

The volume is freely illustrated, and is terminated by a most satisfactory index. J. P. C. G.

AN EPITOME OF THE HISTORY OF MEDICINE. By ROSWELL PARK, A.M. M.D., Professor of Surgery in the Medical Department of the University of Buffalo, etc. Based upon a course of lectures delivered in the University of Buffalo. Second edition, illustrated with portraits and other engravings. Pp. xiv., 370. Philadelphia: The F. A. Davis Co., 1899.

THE author begins his preface with the statement that the history of medicine has been sadly neglected in our schools—a statement as melancholy as it is true. Individuals are continually met with who have a reverence for and are versed in the achievements of those who have gone before, but there are few instances of any systematic endeavor to impart any knowledge of the wonderful history of his art to the student on the benches. In institutions for the teaching of theology or law or military science there are always provisions for the instruction of the student in the history of his profession, but in few medical schools is this the case.

The sources from which a knowledge of the history of medicine could be derived are many, but possibly the most profitable is to be found in a perusal of the works of the great leaders of thought in the profession of various periods.

Dr. John Brown, the author of *Rab and his Friends*, advocated strongly that medical students should be required to study the works of the ancient physicians and to pass examinations on them. Certainly, none can doubt that not only pleasure (some might prefer to say amusement) but also profit is to be derived from the works of Paré; and the memoirs of Baron Larrey, though they are, it is true, of much more recent date, still possess real professional value as well as the most thrilling interest.

It is to be most devoutly wished that at some future time a chair will be established in every institution for the teaching of medicine whose occupant shall direct the attention of the student to those who have been epoch-makers in the upward progress of the profession, and that instead of the student having the impression that the previous history of medicine consists in a knowledge that prescriptions of the past were solely made up of snakes and frogs and other nauseating materials, he will be able to recognize for himself that many of the physicians of yore were men of much learning, and often imbued with the most scientific impulses and philosophical aims.

It is customary to lament the fact that medical nomenclature contains so many appellations which, consisting as they do of proper names, convey no meaning as to the part or organ or disease which they designate. These names represent all periods of history and most of the nations under the sun. In the nomenclature of no other science is this

recurrence of proper names so frequent. To the average medical student or doctor they are an unpronounceable, readily confused, and easily forgotten jumble. Yet most of these names should conjure up the master of medicine whose fame it aids to perpetuate, and should recall to the studious the memory of the man who was the discoverer of the organ or the pioneer in the study of disease.

As things go now these weighty names represent naught. What ideas are raised in a medical student's mind when the lecturer mentions the parts named for Fallopius, Glisson, Eustachius, or Sylvius; or if he refers to the pathological conditions which bear the name of Brodie, Bell, or Colles.

He is merely struck with the burden which he bears of being obliged to couple an individual's name to something which it has, for him, no visible connection. If the study of the history of medicine were made a part of his curriculum the student would find these names, so constantly recurring, a source of aid in his studies, as they would serve to recall some interesting event in medical history related to the object of his labors, and thus render the task of connecting the object in his memory with something else more readily accomplished.

The only useful purpose that can be served by such a system of nomenclature is that of subserving historical ends, and when the latter are utterly neglected such a system is worse than useless.

Dr. Park gives a list of the principal authorities on the history of medicine of whose labors he has availed himself in the preparation of his epitome. He includes the work of Baas, which has been made known to the profession in this country by the publication of a translation of it into English. He also refers to the classical work of Bouchat.

An adequate history of medical science in the United States has yet to appear. Since James Thatcher published his sketches of *American Medical Biography*, in 1828, no book worthy the name of a history on that subject has appeared. In a prefatory chapter Thatcher outlined the history of the profession in this country from the first settlement to the date at which he wrote. The local history of medicine in Philadelphia and in Massachusetts has been carefully studied. The late Dr. Toner, of Washington, laboriously collected all the material which he could obtain bearing on the medical annals of the colonial and revolutionary periods, but the result was all contained within several small pamphlets.

Dr. Park truthfully terms his book an epitome, for it is in reality nothing more. It is, however, a very excellently compiled epitome, and Dr. Park is to be congratulated upon the judicious manner in which he has weeded out the important events in medical history from the mass of rubbish in which they lie embedded. We would heartily recommend all physicians to get this book and read it, and to have it continually at hand for reference. Where the author is compelled by limitations of space to be brief, he has usually contrived to indicate the manner in which the subject can be further pursued by those desirous of acquiring more information.

The book contains a few inaccuracies. Thus, on page 290, he speaks of Dr. Kirkbride as having been Superintendent of the Philadelphia Asylum. As everyone is aware, there is no institution bearing such a title, and Dr. Kirkbride was Superintendent of the Insane Department

of the Pennsylvania Hospital. On page 279 he mentions that Benjamin Franklin, when a young man, was a violent opponent of inoculation for smallpox, but does not do Franklin the justice to say that he afterward changed his views completely and wrote a pamphlet in support of the practice, and in his *Autobiography* expresses the regret he felt, when a son of his died of smallpox, that he had not had him inoculated previous to the attack.

The author has followed the classification of the epochs of medical history which was made by Renouard, and which is perhaps as satisfactory as any that could be devised.

The book forms a handsome volume, well printed and tastefully bound. The interspersed illustrations, chiefly from old engravings and old works on medicine, are commendably chosen and handsomely executed.

F. H. P.

THE THROAT AND NOSE AND THEIR DISEASES: Being the fifth, revised, and expanded edition of *The Throat and Its Diseases*, with illustrations by the author, LENNOX BROWNE. London: Balliere, Tindall & Cox, 1898.

WE may say at once that this is Great Britain's best work upon the diseases of the nose and throat. Even when it was first published, some twenty years ago, it was immediately recognized as a most valuable contribution to the literature of this specialty, and since then each successive edition has been so great an improvement upon its predecessor that now we may regard it as *facile princeps* among the many works on rhinology and laryngology that have appeared in Great Britain during the past dozen or fifteen years. For this last edition, the fifth, the author has been fortunate in obtaining the aid of Collier, Cagney, and Wingrave, each of whom has contributed matter of much value. Just previous to his death Cagney re-wrote the chapter on the nervous affections of the larynx, and this is now one of the most interesting and profitable chapters in the book. As a matter of course, the controversy respecting the validity of "Semon's law" is given ample reference, and the subject is brought well up to date. There can be no question that the weight of evidence, both that founded upon clinical observation and that upon experimental research, is very greatly in favor of our acceptance of Semon's conclusions as opposed to those of Grossman. Now that a general and keen interest has been aroused in the matter, closer clinical study, followed by more frequent and more minute post-mortem investigation, will probably lead to an early settlement of this somewhat heated discussion. To the consideration of the etiology of nasal and throat diseases has been added a brief but valuable chapter dealing with their bacteriology. This is illustrated sufficiently, and will prove an excellent guide to those who wish to increase in this way their diagnostic resources. In his chapter on diphtheria Browne is far from being enthusiastic in his approval of the antitoxin treatment. Conclusions derived from statistics and the apparently lessened mortality which they give he regards as almost valueless, because the bacteriological test has so greatly altered the former accepted proportion between the number of deaths from diphtheria and the actual number of cases of the disease. The microscope and the culture-tube now class a large number of cases as diphtheria which formerly, upon merely

clinical grounds, would have failed of recognition. This question of the value of the antitoxin treatment is another of those which will require a little more time to win over the skeptic and the ultra-conservative. One scarcely cares to criticise small matters of detail in this book, because, taking it as a whole, it is so excellent. It is quite elaborately produced, the illustrations being numerous, and, as a rule, most satisfactory. It is a work that will be best appreciated by specialists, and it is to them, indeed, that its size and price will probably limit its sale. C. P. G.

THE PRINCIPLES OF BACTERIOLOGY. By A. C. ABBOTT, M.D., Professor of Hygiene and Director of the Laboratory of Hygiene, University of Pennsylvania. Fifth edition. Philadelphia and New York: Lea Bros. & Co., 1899.

A MANUAL OF BACTERIOLOGY. By HERBERT W. WILLIAMS, M.D., Professor of Pathology and Bacteriology, Medical Department University of Buffalo. First edition. Philadelphia: P. Blakiston, Son & Co., 1898.

THE PRINCIPLES OF BACTERIOLOGY. By DR. FERDINAND HUEPPE, Professor of Hygiene in the University of Prague. Authorized translation from the German by DR. E. O. JORDAN, Assistant Professor of Bacteriology in the University of Chicago. The Open Court Publishing Company, Chicago, 1899.

ABBOTT'S *Principles of Bacteriology*, appearing in its fifth edition within seven years, needs no recommendation here.

As a student's manual of instruction, and as a techincal guide that is thoroughly up to date, it is unsurpassed; it is, too, an interesting exposé of a subject the details of which are usually tiresomely monotonous.

Williams's *Manual of Bacteriology*, in its first edition, is scarcely more than half the size of Abbott's, and, as was to be anticipated, is not such a complete or detailed exposition of the subject. Though manual in size, Abbott endeavors to make a critical study of the moot points, while Williams states only the general facts of the case.

It is impossible to find fault with the student who, with five to ten examinations before him, looks for the shortest road to the end of his subject; but this is no reason why teachers should aid him by setting before him naked facts divested of the details that make them interesting and possible of retention.

"The view prevailed in the middle ages that every sin is under the control of and operated by a particular devil; at present each disease, in a similar fashion, has its own devil in the form of a specific bacillus." This sentence, quoted from *The Principles of Bacteriology*, by Dr. Ferdinand Hueppe (translated by Dr. E. O. Jordan), probably gives a better idea of the nature and purpose of the book than a lengthy criticism. He starts out his preface with "Bacteriology is just now in transition from the natural history stage to the scientific," and he acknowledges that he leaves the former aspect of the question to be dealt with in text-books and manuals generally, while he devotes himself entirely to the scientific consideration of the subject. His develop-

ment of this theme consists in a monograph disproving the specificity of the microbe in the production of disease. He insists "If pathogenic bacteria are the true and sufficient cause of disease, as Pasteur and Koch have affirmed, then at least four conditions would have to be fulfilled. First, the disease-producing bacteria should exert no other effect than that of producing disease; second, their ability to produce disease should remain constant; third, they should affect all animals in the same way without reference to particular species; and, fourth, they should produce only a single, sharply defined, typical and 'specific' infectious disease. All four of these assumed essentials he easily disproves."

As he denies the specific cause of disease to lie in the microbe, he insists also that it is not in the cell, as presented to us by Virchow's pathology, nor yet again in Pettenkofer's predisposition, but in the dynamical energy dormant in the protoplasm of the body and set free by what he terms "liberating impulses," under which he would include microbic agencies. He draws a simile to explain this in a weight held by a string or a support. The weight possesses in itself the potential energy capable of producing a certain effect. It will be the cause of the effect, yet it cannot act until the support is drawn away or the string cut; but the liberating agencies by which the potential is changed into kinetic energy are only adventitious, even though necessary, antecedents, and can never be called the specific causes of the effect.

The exposition of such a question in a few lines scarcely does justice to it, because with the opportunity to illustrate and compare it is by no means so indefinite as this rendering makes it; but, granting that this unnecessarily profound explanation is nearer the exact truth, and that we are using the words predisposing and exciting causes out of their absolute meaning, it is still to a great extent a question of terminology, and it is impossible for him to avoid introducing as the essential initiatives the bacteria, determining at least the direction of the cause, and the predisposition permitting the bacteria to act.

Besides denying the specificity of the microbe, he denies a specific action on the part of any of our so-called specific remedies. Quinine, mercury, antitoxic serum, he endeavors to prove, exert their power by stimulation of the body cells, not by their antiseptic or germicidal action on the microbe or anti effect on the toxin. It is unnecessary, he affirms, to suppose in the body an antitoxin in cases of tolerance to a poison; in habituation to alcohol no anti-alcoholin is found; in habituation to morphine no anti-morphine, and yet a tolerance to these poisons is established apparently by intervention of the body cells.

On the whole, the book is one of a reformer with a reformer's dogmatic overzealousness. Like the majority of reformers, his general idea is in the right direction—namely, toward more serious exactitude in work and greater accuracy of expression. We are using our terms too loosely, and though we claim to be scientific, we are too often satisfied with the merest superficialities instead of prosecuting our investigations to the depth where the true science is to be found.

Hueppe's book has no claim on the student; in the present problematical state of our knowledge his explanations would obscure in place of clearing up; but to a scientific man there is much that would commend itself, and all would interest and profit. The translation of it needs no apology; we have too few books of this character in English medicine. J. W.

PROGRESS

OF

MEDICAL SCIENCE.

MEDICINE.

UNDER THE CHARGE OF

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Asthenic Paralysis, Albumosuria, and Multiple Myeloma.—SENATOR (*Berliner klin. Wochenschrift*, 1899, No. 8) describes the following rare and interesting case: The patient, a merchant's widow, came to the hospital in February, 1897, with symptoms thought to be those of nephritis, albumin, casts, and epithelial cells being found in the urine. She returned early in March in a worse condition, complaining of pain in the head, back, and legs, and of weakness. Large quantities of albumose were at this time first demonstrated in the urine. She was weak and anæmic, walked with a creeping motion, and complained of a difficulty in swallowing, which so interfered with her nourishment that she became so weak as to be unable to walk. There was no swelling of the glands and no fever. Examinations of the organs of the chest and abdomen were negative. The signs on the part of the nervous system were very striking. There was paralysis of the tongue, which gradually became complete. The patient could neither move the tongue in the mouth nor protrude it, in consequence of which swallowing was difficult, and it was necessary to take nourishment through a tube. The chin felt as if it were dead. There was an anæsthetic zone in which all sensations were absent, extending from the under lip to the chin, 2½ cm. broad. The vocal cords moved fairly well, but there remained a slit in the rima glottidis as a result of paresis of the arytenoid muscles. The other cranial nerves showed no disturbances. The pupillary reflex was good, the fundus of the eye showed no abnormality except pallor. The pharyngeal musculature showed no disturbance. The legs were not atrophied nor paralyzed, but there was great weakness and sensitiveness of the left peroneal and tibial nerves. The patellar reflexes were increased. The blood-corpuscles were pale, but otherwise not remarkable. The tongue showed no distinct atrophy, but in the middle there was often fibrillary twitching. Electric tests revealed

a diminution of the faradic and galvanic excitability of the hypoglossal nerve. In direct irritation with a strong current there was distinct twitching, never a reaction of degeneration. All of the muscles of the face and legs gave normal electric reactions. The rapidity of the pulse was striking during the entire illness, running between 84 to 100—mostly 90 to 96. Notwithstanding feeding by stomach and rectal tube, the patient gradually sank, complained of weakness, insomnia, dyspepsia, pain in the chest and back. For a few days there was slight improvement in the paralysis of the tongue. Meanwhile a gangrenous phlegmon developed in the left gluteal region. Death occured suddenly before an operation could be performed. The symptoms could not be satisfactorily explained by a central cause; hysteria was excluded, and a peripheral cause, often searched for, could not be discovered. On account of the albumosuria, osteomalacia was thought of, but no evidences were present in the skeleton. The post-mortem findings were as follows: Multiple myelogenous round-cell sarcoma of the ribs, double-sided fibrinous pleurisy; broncho-pneumonia of both lower lobes; chronic parenchymatous nephritis with amyloid degeneration; gangrenous phlegmon of the left trochanteric region. The cranial bones and the brain showed no abnormality; the medulla exhibited an irregular distribution of the nuclei; the spinal cord was thin and narrow. The hypoglossal nerves and the lingual muscles gave no explanation of the paralysis.

Senator gives a brief review of our knowledge of multiple myeloma, of the relations of bone-marrow disease to anæmia, and of anæmia to alterations of the spinal cord, and then states his belief that in his case the multiple myeloma led to albumosæmia and albumosuria, with injury to the kidneys, on the one hand, and on the other to severe anæmia, and, on account of a congenital predisposition, an asthenic paralysis.

[The explanation might have gained much in force if the condition of the blood and the spinal ganglia had been more thoroughly investigated.—ED.]

Tabes Following Trauma.—TRÖMMER reports two cases with reference to the relation of trauma to tabes dorsalis. Case 1 was a laborer, aged forty-two years, a moderate drinker, giving no history of syphilis, and healthy until he received a severe contusion of the left foot, followed by swelling, pain, and paræsthesia. Eight weeks later there was deficient erection and slight difficulty in urination. Nine months later there were lancinating pains and weakness in the affected foot. A year later the patient noticed tingling and weakness in both legs. From this time the tabes pursued its usual course. On examination it appeared that the movement of the left foot was diminished about one-third; the circumference of the left calf was 1 cm. less than that of the right; the pupils were unequal and did not react to light; on looking to the left there was slight nystagmus and diplopia; the movements of the head and trunk were weak and trembling; the strength of the limbs diminished; that of the legs more than the arms, and on the left side more than on the right. The tendon reflexes of the arms were retained, though diminished, especially in the left. The muscles of the left leg were more hypotonic than those of the right; the tendon reflexes of the legs were lost. Of the skin reflexes the plantar was lost, and also the left testicular and the left abdominal reflex diminished. The ataxic disturbances were more decided on

the left side. The patient could touch the tip of his nose with the right hand, but not so accurately with the left. The knee-jerk was decidedly more uncertain left than right. Romberg's phenomenon was marked. The asymmetry of the sensory disturbances was striking. It became more marked on nearing the place of injury, so that it was stronger left than right, in the leg than in the arm, and strongest in the left foot. The hemianæsthesia was combined with a hyperæsthetic trunk zone extending between the third rib and the crest of the ilium. On the right side the sensibility for touch, pain, cold, and heat was somewhat diminished in this trunk girdle, less so in the foot. On the other hand, the entire left side below the neck showed diminished sensibility, the leg more than the trunk zone, increasing in every way to the non-sensitive left foot. The sense of position was disturbed in the left little finger and legs, abolished in the great toe. The predominance of all symptoms, motor, reflex and sensory on the side and at the point of injury, was marked, a fact which has not yet been demonstrated in non-traumatic and seldom in traumatic tabes. Among sixty cases of tabes Lähr found only one case with striking asymmetry in its sensory symptoms, and this case was combined with another neurosis. In this case the relation of the trauma to the tabes would seem clear, were it not for the fact that the patient's wife had been twice in an insane asylum, and at the time of writing had psychic symptoms with absent pupil, reflex and knee-jerk. The possibility of syphilis can therefore not be excluded.

In the second case the relation of the trauma—a fall—to the tabes was even less certain, but the ataxia and hypalgesia were more marked on the side of the lesion. In both cases the occurrence of symptoms of tabes began comparatively soon after the injury, a point the author considers important. He is inclined, in such cases, to call the trauma the exciting cause in the sense of the German insurance system.—*Berliner klin. Wochenschrift*, 1899, No. 7.

Glycosuria in Cholelithiasis.—Kausch (*Deutsche med. Wochenschrift*, 1899, No. 7) found in the material of the Breslau surgical clinic during the past eight years eighty-five cases of complicated and uncomplicated cholelithiasis. Seventy of these cases underwent operation. In all of them the urine was examined, and especially for sugar. In only one was sugar found. This is in striking contrast to the results obtained by Exner, who believes that in all cases of gallstone disease there is an increase in the amount of sugar in the urine, independent of the position of the stone or the presence or absence of icterus, and that it disappears three to four weeks after operation. The author's results agreed with those of Naunyn, who in 250 cases of gallstone colic never found glycosuria except in cases of complicating liver disease. The case of glycosuria mentioned by the author was in a woman fifty-six years old and moderately well nourished. For seven years she had had typical attacks of gallstone colic. In one of these attacks, two years previously, sugar was found. The last attack had occurred fourteen days prior to the examination. The liver was not demonstrably diseased, the spleen was not enlarged, and there was no icterus. The quantity of urine in twenty-four hours amounted to 900 cc.; specific gravity, 1025; no albumin. The sugar varied from 1½ to 3, or on one occasion 5 per cent. Kausch subjected Exner's

paper to a very searching examination, and found that his method of examination of the urine was open to severe criticism. Exner stated that in his cases of cholelithiasis he could observe a distinct reduction, much more marked than in normal urine, apparently forgetting that this slight reduction might be effected by kreatin, kreatinin, uric acid, allantoin, traces of grape sugar, and other substances. Exner employed Trömmer's test, Nylander's, the fermentation test, polarization, and the phenyl-hydrazine test, but without regard to the source of error. Strauss suggested that incarceration of the gallstone in the diverticulum of Vater compresses the pancreatic duct, and thus produces glycosuria. The author, however, had in his series one such severe case of incarceration without glycosuria.

In a later number (11) of the same journal Exner clears up some of the points criticised, and Czerny as surgeon pleads for a further investigation of the subject.

The Color-reactions of Diabetic Blood.—HARTWIG (*Deutsche Archiv für klin. Med.*, Bd. 62, p. 287) has made some interesting experiments which increase our knowledge of this subject. He concludes that Bremer's reaction always occurs in diabetes mellitus; that it occurs at times in other diseases, and that an explanation of this fact is not yet available; the reaction is a chemical combination of the dye with hæmoglobin; grape-sugar is one of the causes of the reaction, but it is not improbable there are other things that can produce similar changes of the hæmoglobin; the concentration of a grape-sugar solution that will produce the reaction in pure hæmoglobin must be at least 0.15 to 0.2 per cent. The most important fact brought out by the experiments is that hæmoglobin, the oxygen carrier, undergoes a chemical change in diabetes mellitus. It was already known that in this disease the oxidizing power of the blood is reduced only as regards grape-sugar and not to other substances, even those difficult to oxidize. The change, now shown to exist, is therefore rather a symptom than a cause. The article is noteworthy in showing how a method originally advanced as an empirical one may lead to interesting scientific facts and theories.

A Case of Spastic Spinal Paralysis, with Recovery, Following Influenza.—L. MICHAELIS has found in literature five cases of myelitis following influenza. He adds to these the following case: A boy, thirteen years of age, who was never sick before, and was without hereditary taint, complained of headache, slight fever, cough, and running at the nose. The disease was diagnosed influenza. He was confined to bed a week. On his first attempt to rise he found that he could not walk; his legs were stiff and closely adducted, and there was spasm, first in the right then in the left leg, which became stronger. Subjective symptoms were absent in both legs, and there were none on the part of the bladder or the rectum. On examination, about eight weeks later, all the organs except those of the nervous system were negative. The legs were adducted and only separated by considerable force. The right foot was flexed and supinated, presenting pes equino-varus. The adductors of both thighs were hard and rigid. The patient could walk only with assistance, the gait being spastic and paretic in type. The knees were flexed, the steps small, and the feet lifted only a little from the ground. As the patient lay in

bed frequent spasm was seen in the muscles of the lower extremities. There was no atrophy of the muscles, and neither nerve-trunks nor muscles were painful to pressure. The patellar reflexes on both sides were strongly increased, while other reflexes were normal. There was no ankle clonus. The upper extremities were normal, and there was nothing pathological in the cranial nerves. The senses of touch, pain, temperature, and position were intact. There was no ataxia; the movements of the eyes, pupillary reflexes, and the eye-grounds normal. Urine and feces were passed voluntarily. After four to five weeks treatment with potassium iodide, warm baths, and galvanization there was distinct improvement. By the end of ten weeks he had fully recovered. In deciding upon the cause of this disease the author excludes spinal hemorrhage and hemorrhagic myelitis, tumor and primary lateral sclerosis, and concludes that an acute myelitis following influenza accounts for all the clinical phenomena. Numerous other diseases of the central nervous system have been found to follow influenza, and, as a rule, have a relatively good prognosis. Leichtenstern especially has reported a great number of nervous diseases following the epidemic of influenza in Cologne, such as monoplegia and hemiplegia, meningitis, and especially hemorrhagic encephalitis. Pfuhl demonstrated the influenza bacillus in seven cases of cerebro-spinal meningitis following influenza. In the above case the recovery excludes a severe anatomical lesion of the spinal cord, and the author considers more probable either a circumscribed inflammatory process or a toxic functional disturbance, the toxic process being made probable by Breiger's observations on a case of spastic paralysis in lead-poisoning.—*Deutsche med. Wochenschrift*, 1899, No. 7.

The Diazo-reaction and its Clinical Significance.—M. MICHAELIS (*Deutsche med. Wochenschrift*, 1899, No. 10) contributes a valuable paper upon this reaction, in which he confirms the work of Ehrlich, first published in 1882. The number of cases examined was very large. Some of the results were as follows: By far the greatest number of cases in which the reaction was found belonged to the class of infectious diseases. The diazo-reaction is entirely independent of rise of temperature. There are infectious diseases with absolute freedom from fever—as tuberculosis—which give an intense diazo-reaction. On the other hand, in acute infections, such as influenza and pneumonia, with high temperature, up to 40° C., no suggestion of the reaction was found. In the same disease the temperature and the diazo-reaction did not, as a rule, have parallel curves. The temperature can rise and the diazo-reaction disappear, and the reverse can happen, as in collapse. While, as a rule, an increase in the diazo-reaction is associated with an advance in the degree of the infection, yet in fatal cases it may disappear in one to two days before death. The author divides diseases into four groups, depending upon the presence and the time of appearance of the reaction. Group 1 includes those affections in which the reaction is very seldom found—*i. e.*, chronic organic diseases, such as nervous diseases, mental diseases, affections of the spinal cord, chronic heart and kidney diseases, gout, diabetes, syphilis, malignant tumors, etc. If the diazo-reaction happens to be present in these cases the author believes there is a secondary infection, such as an ulcerating carcinoma and similar processes, with bacterial infection. Group 2 includes

those cases in which the diazo-reaction is nearly always present, and in most cases is found in the beginning of the disease. Typhoid fever and measles especially belong in this class. The presence of the reaction in these diseases is of great diagnostic value. In typhoid fever, between the third and seventh days, when perhaps the rose-spots are absent, and there is no enlargement of the spleen, and in place of the typical pea-soup stools there is constipation, the slight evening fever and feeling of malaise only suggest typhoid, while a distinct diazo-reaction makes the diagnosis certain. By noting the increase, the diminution, or subsidence of the reaction it is possible to follow the course of the infectious process. This is of great significance, because while the fever is still in the stage of acme the reaction may disappear three to five days before the beginning of the decline. In a case of typhoid fever seen for the first time on the ninth to tenth day, in which the diazo-reaction is absent, it can be said that the infection has begun to disappear, and that it will run a mild course. If, on the other hand, the reaction continues for a long time, or its intensity increases during the course of the disease, the prognosis is much more serious. The reaction is also of value in diagnosing a relapse. By its presence on the first day of the return of the fever it is possible to make a certain differential diagnosis between a recurrence and a secondary fever brought on by other causes. The diazo-reaction is present in the majority of cases of measles in the beginning of the disease, and by its increase or disappearance it is possible to measure the course of the disease. It is of service in differentiating rubella from morbilli, as it is not present in the former. Group 3 includes such diseases as scarlatina, erysipelas, sepsis, pyæmia, pneumonia, and diphtheria, in which the diazo-reaction is only occasionally present. The increase or decrease in its intensity gives a criterion as to the course of the disease. If it is present in pneumonia or diphtheria, which is rare, it indicates that the case is a grave one, or that there are complications. In operations on empyema and pyæmic processes the continuance or disappearance of the diazo-reaction affords a valuable and early proof of the success of the surgical procedure. Because of its special significance phthisis is placed in a group by itself. The author states that if he has a consumptive whose urine gives a striking diazo-reaction he considers that he has to deal with a very extensive disease process, or that the phthisis will run a very rapid course. The majority of these cases will die in less than half a year. Fraenkel considers the diazo-reaction one of five diagnostic factors in acute caseous pneumonia. The author places all cases of tuberculosis giving the diazo-reaction in the third stage. He emphasizes the great practical value of this fact, and would make it a rule to exclude all tuberculous patients giving the diazo-reaction from sanitoria in which improvement or complete healing are expected. The question as to the nature of the body that gives the reaction is still unsolved. It resists boiling, and can be preserved for a long time in urine which has been evaporated to a syrupy consistency. There are a number of substances in the urine which give a reaction very similar to that of Ehrlich. These always require a stronger solution of the reagent or a greater alkalinity of the urine. If Ehrlich's directions are followed it is possible to exclude color reactions by such bodies as sugar, acetone, and medicines (with the exception of naphtalin).

[Observations carried on for eight years in the editor's clinic confirm the author's statement, especially with regard to tuberculosis.—G. D.]

Bacillus Icteroides and Bacillus Choleræ Suis.—Reed and Carroll (*The Medical News*, April 29, 1899, p. 513) in the course of a comparative study of bacillus X (Sternberg) and bacillus icteroides (Saranelli) also observed the effect of the intravenous injection in dogs of the bacillus coli communis and the bacillus choleræ suis. They found that the same clinical symptoms—viz., vomiting, increased action of the bowels, and profound prostration—which are produced in dogs by the intravenous injection of B. icteroides are also brought about by a like inoculation of the hog-cholera bacillus. The anatomical changes were similar with both organisms, but in neither instance was the degree of fatty degeneration at all comparable with that present in the human liver in yellow fever. The results of inoculations of guinea-pigs, rabbits, and pigeons with these organisms and the feeding of them to hogs were similar in both cases. An important point in their work was the observation that the serum of an animal immunized with B. icteroides had a marked agglutinative action on the hog-cholera bacillus. The cultural characteristics of the two organisms were almost identical.

As a result of the striking similarity in the cultural characteristics of the two bacilli and of their pathogenic action on various animals, Reed and Carroll believe that the B. icteroides (Saranelli) is a variety of the hog-cholera bacillus, and should be considered only as a secondary invader in yellow fever. They find that the bacillus X (Sternberg) shows marked differences from the above-mentioned organisms, both as to its biological character and its pathogenical action toward animals. They are of the opinion that the bacillus X should be placed with the colon group.

PEDIATRICS.

UNDER THE CHARGE OF

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The Distribution and Origin of Tuberculosis in Children.—Leonard G. Guthrie (*The Lancet*, February 4, 1899, p. 286) has tabulated his notes on seventy-seven post-mortem examinations made on children dying from tuberculosis in the Children's Hospital, Paddington-green, during a period of eight years. The following conclusions are given:

1. The thoracic tuberculosis in children is more common than abdominal in the proportion of three to two. 2. Tabes mesenterica as a cause of death

in young children is practically unknown. 3. The preponderance of thoracic over abdominal tuberculosis is not necessarily and solely due to the direct entry of bacilli into the air-passages. In addition to this mode of infection the lungs may be affected (*a*) by bacilli entering the thoracic glands through the lymphatics of the pharynx, tonsils, and œsophagus above, and through the lymphatics of the intestines and the abdominal glands below; and (*b*) by the entry of bacilli through the thoracic ducts into the pulmonary circulation via the right heart. 4. Primary infection through the alimentary tract does not prove that food has been the sole source of evil. Therefore tuberculosis in children is not likely to be materially checked by purification of the milk-supply alone. 5. The alleged increase of tuberculous meningitis of late years is probably due to pulmonary tuberculosis set up by severe epidemics of measles.

A Rare Complication of Measles.—Von Starck (*Jahrbuch f. Kinderheilkunde*, Bd. xlvii., S. 2) records a case of severe measles in a girl, aged eight years, in which on the second day of the eruption marked symptoms of spinal meningitis and irritation of the nerve-roots made their appearance. Full recovery followed in about three weeks. No other cause but the measles could be determined; the child had been previously perfectly healthy and had sustained no injury. Similar cases have been observed after scarlatina and typhoid fever, but they are extremely rare after measles. Lumbar puncture was not performed in view of the rapid and favorable course of the disease.

Extract of Whortleberry in the Treatment of Eczema.—Daxenberger (*Centralblatt f. Kinderheilkunde*, 1898, iii. 439) speaks very favorably of this drug in various forms of eczema, especially in children; also in the mycotic forms in smaller ulcerations of the skin and mucous membranes, rhagades, etc. The extract, of the consistency of syrup, is applied by means of a brush after the surface has been cleansed and dried. Over this a dusting powder may be sprinkled. Drying takes place rapidly, and the pellicle adheres so tightly that other dressing is unnecessary. By this means eczema was often cured in one to two days.

Anuria in Diphtheria.—Braun and Thiry (*Société de médicine de Nancy*, February 22, 1899) report the case of a child, aged six years, suffering from strepto-diphtheria, in which an injection of 18 cc. of antidiphtheric serum was immediately followed by total anuria, which lasted until death, thirty-two hours afterward.

The autopsy showed, beside the ordinary alterations encountered in diphtheria, profound lesions of the kidneys (hemorrhages, vaso-dilatation, glomerulitis, and intense nephritis), Loeffler bacilli, streptococci, and staphylococci in all the organs and in the blood.

The authors consider the anuria due to profound alterations of the kidneys resulting from the disease and not directly attributable to the serum, which, however, must be regarded as a determining cause where other conditions were favorable.

The Etiology of Black Tongue.—WM. S. GOTTHEIL (*Archives of Pediatrics*, April, 1899, p. 255) reports an instance of this rather rare affection in a boy aged two years. The child had always been perfectly healthy except for the affection of the tongue, which had first been noticed at the age of one year. The mother had taken him to a physician at the time, and he was given some medicine which cleared off the deposit in a few days, but it had soon returned. The centre of the dorsum of the tongue was occupied by a dark, greenish-black streak, commencing abruptly immediately in front of the circumvallate papillæ, and extending down almost to the tip. It was about three-fourths of an inch wide posteriorly, narrowing gradually toward the anterior. The rest of the tongue and the mucosa of the mouth were normal. The black streak was slightly elevated, its surface looked gelatinous, and it ended in rather an abrupt margin on either side, the rest of the dorsum being not even coated. There was no apparent papillary hypertrophy, and none of the thread-like excrescences which had been noted in so many of the recorded cases, from which the name of hair tongue or black-hair tongue has originated.

Scrapings of the streak examined under the microscope revealed (beside normal epithelial cells of various kinds, detritus, and some small round spore-like bodies) masses of large irregularly oval, semi-transparent bodies showing a faint gray color under the lens. There were no pigment granules either in them or in the surrounding fluid. Their grayish color was hardly apparent with the one-tenth immersion, but was plainly discernible with the quarter-inch objective. These cells were unconnected with one another, were not arranged in series, and there was no mycelium. Some of the oval bodies showed buds, but none of the specimens examined showed cells in active proliferation.

The discoloration disappeared in about a week under the use of a mouth wash of a saturated solution of hyposulphite of soda.

The case differs from the earlier recorded cases of black tongue, in which the hypertrophy of the filiform papillæ was a marked feature. Later observers, however (notably Ciaglinski and Hewelke and Sendziak), have described cases in which the papillary hypertrophy was absent. The two former also described a parasite similar to the one observed in Gottheil's case, which they believed resembled the mucor rhyzopodiformis. Parasitic fungi agreeing in morphological appearances with those above described were also found by Dessios, Laveau, Lancereaux, Schech, Gubler, Gundobin, and others.

The affection is apparently quite harmless, save for the slight discomfort it occasions.

Acute Nephritis in an Infant Probably Due to Saccharin—G. A. HIMMELSBACH (*Buffalo Medical Journal*, June, 1899) reports a case of fatal acute nephritis in a baby of fourteen months which he attributes to saccharin used as a sweetening ingredient of its food. The child had been breast-fed until one year old, and then the breast-feeding was supplemented by several feedings of a preparation of cow's milk, consisting of milk, cream, crystal water, and saccharin, the proportions being varied as the child grew older. He had been perfectly well until a few days before death. Five days before the baby was first seen by the reporter, which was only twenty-two hours before

death, the breast supply had been completely stopped and the milk mixture had been given exclusively. The baby died in coma, and the cause of death was not known until after the autopsy. Urine removed from the bladder at this examination showed the presence of a large proportion of albumin, with hyaline, epithelial, and granular casts, leucocytes, and red corpuscles. Sections of the kidney showed the lesions of acute parenchymatous degeneration.

The use of saccharin had been begun at the age of two months, being then added to its drinking-water, and the drug was administered uninterruptedly until death at fourteen months. During the last two months this substance was added to the artificial food as well as the drinking-water. At first the amount averaged one-sixth of a grain per diem, but it was gradually increased until finally at least four or five-sixths of a grain were given daily.

It is known that saccharin is absorbed as such, and is eliminated unchanged by the kidneys, but up to the present time the few observations of the action of this drug upon man have been confined to a few days of administration, and have shown no distinct effect upon the kidneys. The author believes, in the absence of any other discoverable cause, that the prolonged excretion of saccharin by the kidney was directly responsible for the renal degeneration in this case.

Rubeoliform and Other Eruptions, with Special Reference to Koplik's Phenomenon.—J. SOBEL (*Medical Record*, June 3, 1899, p. 781) gives noteworthy conclusions in regard to the value of Koplik's sign in diagnosis.

It is not uncommon for the initial symptom of influenza to suggest measles. In the presence of such symptoms the absence of Koplik's spots excludes measles; in the absence of any symptoms the presence of this phenomenon proves the case to be a beginning of measles. What is true of influenza holds good for coryza, tonsillitis, bronchitis, febricula, etc.

German measles cannot be excluded more satisfactoily than by the absence of Koplik's spots. The moderate elevation or absence of elevation of temperature, the lack of proportion between the cutaneous outbreak and the general symptoms, the non-existence or mildness of coryza, the lighter color, smaller size, and more concentric character of the eruption, the soft-palate eruption of Forchheimer, and the enlargement of the glands behind the sternomastoid are all of inferior worth, he thinks, as differential factors when compared with these spots He has seen a number of cases of German measles in which rubeola was excluded by the absence of this sign, and the diagnosis substantiated by the failure of any subsequent symptoms of measles. The fact of second attacks of true measles, which has long been accepted by clinical observers, has received peculiar confirmation from the recent observations of Knöspel, of Prague, who has diagnosticated a second attack of measles in the same patient by the presence of Koplik's spots. It is thus seen that in the subsequent as well as in the initial attack of measles Koplik's spots are present. The presence of the spots has also made possible the diagnosis of a measles eruption from the morbilliform eruption which occasionally follows from four to six days after the administration of diphtheria antitoxin. Le Fetra (*Medical Record*, October 8, 1898) has reported a case of measles complicating diphtheria for which antitoxin was adminstered,

and the presence of Koplik's spots rendered the diagnosis of measles positive and excluded antitoxin rash.

Cases of erythema multiforme (papulatum, annulare, and gyratum), which frequently begins upon the face, and is accompanied by fever, headache, muscular and joint pains, and malaise, can be definitively distinguished from measles, according to Sobel, by the absence of Koplik's sign. Urticarial eruptions, especially when of the erythema-multiforme type, if considered in conjunction with their sudden appearance, the greater elevation of the lesions, their ephemeral character, the presence of itching, the lack of general symptoms, and, above all, the absence of Koplik's spots are readily distinguished.

Generalized vaccinia, of the urticarial and erythema-multiforme character, and violent cases of miliaria can be readily differentiated from measles by the absence of this sign.

Macular syphilide may at times be confounded with measles. The author has reported such a case in a boy, aged fifteen years, in whom all thought of syphilis was dispelled by the presence of Koplik's spots.

The value of the sign has also been tested in cases of drug eruptions caused by copaiba, antipyrin, quinine, bromides, and iodides.

Very puzzling conditions are sometimes presented when measles impresses or engrafts itself upon pre-existing skin lesions. The author reports a case of papular eczema in which a marked inflammatory change had suddenly occurred in the eruptive lesions. The rectal temperature was found to be 105°, but the catarrhal symptoms were slight, and the diagnosis uncertain but for the discovery of Koplik's spots.

Knöpsel has recorded instances of double infection with measles and scarlatina in which Koplik's sign was discovered five days before the eruption of measles made its appearance. The isolation of these cases, it is said, prevented an epidemic of measles in the scarlet-fever pavilion.

The sign would also be of great value in differentiating the rare condition termed erythema enematogenes from measles, which it is said it occasionally resembles.

SURGERY.

UNDER THE CHARGE OF

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The Reconstruction of a Perfectly Functionating Anal Sphincter from the Levator Ani and Glutei Muscles.—LENNANDER (*Cent. f. Chir.*, June 24, 1899) has devised an original and successful operation for the restoration

of the anal sphincter in a case in which it had been destroyed by a phlegmonous ulceration which originated in the ischio-rectal spaces and left the patient without the power to retain either flatus or feces, even when astringents and opiates were employed. The opening into the rectum readily admitted three fingers, and electrical stimulation failed to reveal any contractility of the anal sphincter. Subsequent examination, after a successful operation had been performed, showed a local anæsthesia in the area about the anus and in the mucous lining of the gut, which made it highly probable that the nerves had been destroyed as well as the muscle.

Finding no analogous or similar cases reported in literature, he determined to construct a new sphincter, employing for this purpose the levator ani muscles, which have been shown to have the power of contraction in a manner similar to the anal sphincter. After careful dissections of the male perineum and a study of the possible operations he performed the following, with results that were all that could be desired, as the patient secured perfect control over both flatus and feces, even when the latter were liquid:

An incision followed the line of the sacrum and coccyx to the tip of the latter bone, and then took a horseshoe-form about the rectum. The posterior portion of the levator ani and the anterior portion of the coccygeus were laid bare by dissecting back the glutei from their median origin. The levator ani muscles were freed from the coccyx and coccygeal muscles, although the separation was not made completely to the margin of the pelvis, as it would have interfered with the innervation of the muscles by dividing the nerves which are found there springing from the sacral plexus. These portions of the levator ani were carried on either side of the rectum, and fixed to the anus in such a manner that their contraction produced a constriction of the rectum. The median portion of both glutei muscles were separated from the tubero-sacral ligament, the sacral bone, and the coccyx, and used to fill the defect in the pelvic floor caused by the displacement of the levator ani muscles. They were united in the median line with each other, with the levator ani muscles, and with the skin of the anus. The after-treatment consisted in electrical stimulation and the use of small enemata to accustom the rectum to retain its contents.

The Prevention of Thrombosis in the Veins of the Lower Extremities after Operations in which Rest in Bed for a Long Period is Necessary.—LENNANDER (*Cent. f. Chir.*, 1899, No. 19) cites a number of cases in which thrombosis of the veins of the lower extremities has occurred while the patient was confined in bed during a convalescence from a serious operation or a protracted illness. In some of the cases death resulted from the passage of an embolus through the heart, or serious complications were the result of its entrance into the lungs. He has studied carefully the conditions under which the thrombosis has taken place, and has come to the conclusion that it is not the result of the diseased condition *per se*, but of the lowered blood-pressure and anæmia that result, and the retardation that takes place in the venous circulation on account of the position in which the patient is placed by the necessity for absolute rest in a recumbent position. He believes that it is possible, in the majority of cases, to prevent thrombosis of the veins in the lower extremities by raising the lower end of the bed upon blocks of

wood, thus assisting the flow of blood back to the heart. There are, of course, other things to be attended to. The patient's nutrition and the blood-pressure must be increased by appropriate tonic treatment, while constriction of the veins must be avoided.

The raised foot of the bed is also to be recommended in other conditions in which thrombosis may occur besides those following surgical operations, as in purely medical cases, such as anæmias, and in all conditions where there is an altered condition of the blood in which not infrequently thrombosis develops. He gives as instances typhoid fever, chronic enterocolitis, and peritonitis, that recover without operative interference.

Sealing of Operative Wounds About the Abdomen.—Bishop (*Medical Chronicle*, April, 1899), in dealing with the treatment of abdominal wounds by drainage, shows that these drains have frequently been the entrance through which bacteria have penetrated into the abdominal cavity and produced septic processes, and even death. He believes that the peritoneum is itself capable of destroying a certain number of bacteria, and that in cases that are not previously septic, where asepsis is employed with rigor, and we are certain of our technique, it is unnecessary to provide drainage. In addition to forming the avenue through which infection may enter the abdomen, glass drainage-tubes have been known to produce serious injury to the granulations that have formed about them, or to masses of granulation that have penetrated and filled their lumen from below. In addition to all these dangers, the drainage-tube has frequently been the etiological factor that has resulted in a ventral hernia by weakening the scar. Further autopsies have frequently shown that drainage-tubes do not drain, as collections of pus have been found close to the tube after the death of the patient. The revolution in our knowledge regarding the value of the fluids secreted in the wound, in contrast to their harmfulness, makes us all the more willing to do away with these tubes and exclude the bacteria. The first dressing of a wound is a bugbear, because infection of an aseptic wound has so frequently taken place at that time. This is avoided, the author believes, by employing an occlusive dressing in the beginning. He employs a celloidin dressing, which, in addition to being transparent, has a tendency to contract the skin and vessels immediately around the line of union, so limiting the tendency to overfulness of these vessels after any traumatism. The formula which he employs is the following:

Celloidin	. . . . .	1 part.
Abs. Aeth. Sulph.	. . . . .	ää 4 parts.

It is a clear fluid, and requires to be kept in a cool place and in a well-stoppered bottle. It is applied with a brush to the absolutely dry surface it is intended to cover. In order to obtain such dryness it is well to wash the part quickly with ether. It causes contraction, and the part may sink below the surrounding. About the ninth or tenth day the edges become loose, the central part still remaining firm. By the twelfth day it will be cracked. The sutures are all that hold it, and they should be cut close to the knots, which can be readily seen through the film. Generally a second application

is unnecessary. This application is especially valuable in children, since it is difficult to make them leave the dressing alone, and there is danger of soiling.

A New Absorbable Ligature Material.—SNEGUIREFF (*Cent. f. Chir.*, June 17, 1899) reports the clinical results of his experience with a new absorbable ligature and suture, which he finds to be absorbed a little more slowly than catgut, but to be capable of absolute sterilization. The ligature is made from the ligamentum nuchæ of the reindeer by dividing it in the direction of its fibres. The process of preparation is the following: Removal of fat in ether, soaking in juniper oil for fourteen days, removal of oil with ether and alcohol, soaking for two days in a $\frac{1}{3}$ per cent. sublimate solution in 80 per cent. alcohol, finally two days in normal sterile salt solution; preservation in alcohol. Bacteriological examination and the clinical test of eighty-three major operations have proved the absolute sterility of this material, and that it is absorbed as soon as is desirable.

Formalin in the Surgical Treatment of Tuberculosis.—HAHN (*Cent. f. Chir.* June 17, 1899) reports some very interesting results which he has obtained by the substitution of formalin for iodoform in glycerin in the treatment of tubercular arthritis and tubercular abscess, and even in tubercular empyema of the pleura.

His series of clinical experiences has extended over a period of two years, and the results have been highly satisfactory. He employs one to five parts of a 35 per cent. solution of formalin in 100 parts of glycerin, injecting into a joint, after it has been aspirated and washed out with boric acid solution, one-third to one-half the amount of the formalin mixture that there was of pus before aspiration. The limb is put at rest. Then follows an elevation of temperature and marked reaction, with swelling and an amount of pain that sometimes demands morphine. The reaction subsides in a few days and the swelling decreases. At the end of two weeks it is well to repeat the injection where possible. Complete healing occurs after a short time, with restoration of function.

Where there are caseous granulation masses that are not broken down and cannot be aspirated at first, it will be found that the glycerin and formalin will break them down, and that at the subsequent aspiration they can be washed out.

The Excision of Hemorrhoids.—REINBACH (*Beiträg. zur klin Chir.*, 1899, Band xxiii., Heft 3) has studied the comparative results of excision and other methods as employed in Mikulicz's clinic. He finds the excision method to be almost ideal; the entire pathological area is removed; a rapid healing by primary union is secured with a linear scar. The patient is, in fact, returned to a normal condition. The v. Langenbeck operation has been followed by good results, except in four cases, where other intercurrent conditions have decreased its efficiency; in one case a relapse was certainly present. The excision method is to be most warmly recommended, and the author hopes that its employment may be generally adopted.

On the Sterilization of Catgut.—DARLING (*Journal Boston Society of Medical Sciences*, May, 1899) has made a series of interesting and successful experiments in testing different methods of sterilization and the effect on the tensile strength.

He finds that catgut can be effectually sterilized by dry heat, without decreasing its tensile strength or making it brittle, by wrapping the separate strands in several layers of paraffin paper. This simple procedure prevents the driving out of the moisture and fat in the catgut, so that it remains unshrivelled and flexible after a prolonged exposure to dry heat. This is the method of Boeckmann. By testing a series of strands of different sizes and qualities he found that a temperature of 140° to 160° C. would effectually sterilize the gut, and would not injure its strength or make it brittle, if employed continuously for one hour. A similar series of tests by the paraform and other methods showed them to be less efficient, and led the author to the following conclusions:

1. Catgut can be sterilized by dry heat with but slight loss of tensile strength.
2. Dry paraform gas is of doubtful value for the sterilization of catgut.
3. Methods of sterilization which involve soaking in antiseptic solutions tend to weaken the catgut to a greater or less degree.

The Surgical Treatment of Nephritis.—FERGUSON (*The Medical Standard*, June, 1899) has applied the surgical principles which would be applied in similar conditions existing in more superficial organs to inflammation of the kidney. It is wonderful that an inflamed kidney ever recovers, and it is probably only on account of its great vascularity, abundant nutrition, and the natural sources of drainage that it has through the uriniferous tubules that it does recover. If by surgical means only sufficient of the kidney can be saved from destruction to carry on even a small portion of the excretory function allotted to it, a great advance will have been made; for we know from the condition of the kidney as found after other diseases, as calculus, that it requires only a small portion of a kidney to sustain life. The surgical principles of treatment we would apply in another organ to prevent the tension, threatened necrosis, molecular destruction, and obstruction to secretion found in the kidney are aspiration, puncture, scarification, free incisions, thorough drainage, etc. Why not apply them to the kidney? Where operations have been performed upon such kidneys through errors of diagnosis the surgeon has been surprised to find the patient relieved of symptoms and, at least symptomatically, cured. Floating kidneys that have been stitched but not opened, or their capsules removed, have been found to continue to give rise to the same symptoms as before the operation, while those that have been incised, to explore them for stone or have had their capsules stripped back, have given no further symptoms.

The author reports two cases in which the patients had most marked cases of Bright's disease, with severe symptoms; they had been subjected to internal medication and rest treatment, but with no relief. He operated upon them, exposed the kidneys, punctured them, peeled the capsules off in part or in whole, and the patients were relieved of all their symptoms. Small sections were taken from the kidneys in both cases and subjected to

careful microscopical examination, which demonstrated the correctness of the diagnosis.

The author believes it is too early to come to positive conclusions as to the ultimate results to be obtained by surgical exploration of cases of nephritis. But he feels certain that nephritis has a definite surgical relation. This branch of surgery is in its infancy, yet has the power to relieve suffering. Let us not sacrifice lives and organs on the infamous altar of pseudo-conservatism, nor be too cowardly to recommend and put into practice our honest convictions, founded on knowledge obtained by accidental experience or otherwise, but nevertheless purely scientific.

THERAPEUTICS.

UNDER THE CHARGE OF

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Toulylenediamine.—DR. EDWARD F. WILLOUGHBY presents the results of the administration of this drug, which, as has been asserted, increases both the solid and liquid constituents of the bile. A woman, aged forty-five years, the mother of several children, suffered from intense pain in the epigastrium, often leading to vomiting. Digestion became impaired, there was loss of flesh and strength, and attacks of pain became more frequent. Various methods of treatment gave no result. This remedy was made into one-grain pills, and treatment commenced with one pill each day. After a week no ill effects or appreciable benefit having been observed, the dose was increased to one pill morning and evening. From that time the most indisputable improvement set in; the attacks became fewer and trivial; once only was there vomiting, and only once was morphine needed. Three weeks later they ceased altogether, and the patient was able to eat and drink as any one in perfect health, to walk and go anywhere; the bowels became regular, the stools normal; sallowness and emaciation have disappeared. The effect of the remedy has apparenly been to stimulate the hepatic cells to a free secretion of normal bile and to restore the mucous membrane of the gall-bladder and duct to a healthy condition. It is assumed that the obstruction was caused by inspissated bile and mucus, or "bile-sand," rather than by calculi, and this was removed by the treament.—*The Therapist*, 1899, No. 3, p. 59.

The Treatment of Gallstones.—DR. W. L. CARR believes that treatment during an attack of pain is best begun with a hypodermatic injection of morphine, one-fourth of a grain, and atropine, one one-hundred and fiftieth of a grain, repeated as required. Chloroform inhalation in intense paroxysmal pain is invaluable. Hot applications should be made over the abdo-

men and to the extremities, to encourage the circulation. Hot baths, when feasible, give relief. Belladonna lessens the spasm of the cystic duct, and is best given in conjunction with the morphine. Large draughts of hot water, with sodium bicarbonate added, will, if retained, give considerable relief, and, if rejected, aid in cleaning out the stomach. Emetics and cathartics are contraindicated during a paroxysm. Treatment between attacks is mainly directed to the diet—fats, sauces, fried articles, and all rich food are forbidden. Sodium bicarbonate, added to a glassful of water and taken before meals, will form a very good substitute for expensive mineral waters. Sodium phosphate is the best laxative. Carlsbad salts and water sufficiently stimulate the gall-bladder and intestines to expel the stones. Six weeks of treatment is sufficient. It is a mistake to continue the use of salines and alkalies. Oil of turpentine is much more likely to stimulate the flow of the fluid bile than to break down old masses of cholesterin. Ether and chloroform, in two-drachm doses, relieve spasm and thus stop the pain. Ether stimulates the circulation, and a feeling of increased comfort results. Examination of dejections may show saponified bile, and less often calculi of cholesterin crystals. Sweet-oil will stimulate peristalsis; the dejections will show "calculi" composed of an oil globule coated with bile. Where there is a temporary complete stoppage of the biliary passages, the administration of bile pills, coated with salol, two hours before meals is of value, preventing putrefactive changes. Massage of the abdomen will empty the gall-bladder of small stones, but may cause the impaction of large calculi, which latter requires surgical treatment, as do constantly recurring attacks.—*The New York Medical Journal*, 1899, vol. lxix. p. 564.

Acokanthera Schimperi.—Drs. Thomas R. Fraser and Joseph Tillie have separated from the wood of this plant a tasteless, crystalline glucoside, which should be named acokantherin, instead of ouabaïne, the vernacular name for a Somali arrow-poison. This glucoside was found to be more toxic to warm-blooded than to cold-blooded animals, the difference being due to its action upon respiration of the former. Its general effects in rabbits are that after the subcutaneous administration of a small lethal dose death actually results in from sixty to eighty minutes. Motor power is gradually impaired, and is usually so much reduced that before death occurs the animal lies prostrate and powerless, and only a few feeble muscular movements indicate the arrest of the heart or respiration. When the dose is relatively large, or when the poison acts with unusual rapidity, the heart or respiration is arrested before general motor depression has set in, and sharp, convulsive movements occur at death. The respiration is rendered irregular, and is often slow, shallow, and abrupt; severe dyspnœic attacks occur from time to time, and not infrequently early in the experiment, so that death from asphyxia seems impending at a time when the cardiac infarcts are forcible and the animal is able to move about freely. This marked respiratory difficulty was not found to occur in several experiments when tracheotomy had been performed. At an early period the cardiac infarcts are usually felt to be more forcible and slower; just before death the rate is usually slow, but sometimes nearly as rapid as at the beginning of the experiments. Usually, respiratory efforts continue for a brief period after

the heart can no longer be felt to pulsate, and, in these cases, on post-mortem examination, the bright red color of the left auricle and the pulmonary veins contrasts strongly with the dark color of the right auricle and of the vena cavæ. Although respiratory movements may occur after arrest of the heart, they are feeble, and the respirations which occur during the few minutes before the heart ceases to beat are often too feeble to sustain life. During most of the experiments the bowels and bladder were evacuated. Toward the close of the experiments the pupils became very slightly contracted, and dilated greatly at death. Large doses injected subcutaneously paralyze the sensory nerve-endings, this being very marked in the neighborhood of the injection. The motor paralysis is not due to paralysis of the muscle, but it is difficult to determine whether at a remote period in the poisoning the terminations of the motor nerves are not weakened or paralyzed, because at the time when stimulation of the motor nerve fails to cause contraction of muscle the muscle itself is found, on direct stimulation, to show signs of paralysis. After the administration of small doses there is, before the arrest of the heart, a period of progressive slowing, the blurring being due to a great lengthening of the diastolic pause. During this period the action of the heart is feeble, its cavities being well filled with blood, and the contractions of auricles and ventricles regular and powerful. After large doses the ventricle becomes arrested in extreme systolic contraction. From transfusion experiments it would appear that diluted solutions do not produce in frogs contraction of the bloodvessels, and even with strong solutions the contraction is slight. So far as blood-pressure is concerned, the rise may be justly attributed to a perfect pumping action of the heart, due to increase in vigor and amplitude of its movements. In time the action of this glucoside is chiefly upon striped muscle fibre, and because of this action, with possibly an action upon the intrinsic cardio-motor ganglia, its chief action is upon the heart. The general conclusion is that it does not differ qualitatively in its action from strophanthin.—*Archives Internacionale de Pharmacadynamie*; 1899, fasc. v. and vi. p. 349.

Salicylic Acid in the Treatment of Pneumonia.—Dr. W. C. Seabring believes this drug to be almost a specific in pneumonia. Of seventy-six patients treated with it but one died. The series cited contain many severe cases, and more than twenty-five were over sixty years of age. The drug is to be given in eight or ten grain doses every two hours. Drugs commonly used are to be given according to the indications, as if the salicylate were not being administered. There is no depressing effect on the heart, and it is the only one of the coal-tar series of which this is true. The writer admits that he has treated but few patients with the salicylate alone, and that they were not severely ill. Recovery followed in every instance, without complications. The following conclusions as to the action of the drug are drawn:

1. Early in the disease a tumultuous pulse is quieted. 2. It is sedative to the general nervous excitement, and also hypnotic in many instances. 3. Pleuritic pain is rapidly relieved. 4. It inhibits delirium. 5. The pulse remains full and not too rapid. Symptoms of a "tired heart" do not occur. 6. Following the first few doses free diaphoresis occurs and continues. The temperature seldom exceeds 103° F. 7. Complications are very infrequent.

8. Defervescence by lysis is the rule. 9. Recovery is more rapid than when defervescence is by lysis as under the usual treatment. 10. Resolution is slower, but complete recovery is more rapid. 11. The severity of the disease is markedly diminished. The drug destroys the pneumococcus; it is absorbed unchanged directly into the blood, and is brought by the blood into direct contact with the pneumococcus. Defervescence by lysis, instead of by crisis, is explained by the action of the drug causing a slow death of the pneumococci, due to unfavorable surroundings, instead of their sudden death occurring, a crisis resulting.—*Medical Record*, vol. lv. No. 16, p. 558.

Heroin.—Dr. A. W. Bekeroff has made use of this remedy in the treatment of twenty-five patients suffering from tuberculosis, in dose of one-tenth of a grain in powder or pill. In about fifteen minutes after its administration cough ceases and sleep is possible. The respiration, especially when increased by coughing or pleuritic pain, is slower and deepened. In case of disease of the heart, or oxygen-hunger from encroachment upon the respiratory area (large cavities), this remedy is of little or no value. It has but little influence upon the circulation as regards either frequence or fulness, further than that respiration is benefited. It relieves chest-pain, and so favors sleep. Insomnia due to mental excitement is not markedly relieved. It is well borne, even if digestive disturbances exist. It is indicated in the treatment of hæmoptysis because of its beneficial action on cough. Patients do not become readily accustomed to its action, and it may be administered for a month without necessity arising for increase of dose.—*Klinisch-therapeutische Wochenschrift*, 1899, No. 14, S. 118.

The Treatment of Typhoid Fever.—Dr. F. G. Finlay agrees with the advocates of the cold-bath treatment, that nervous symptoms are diminished or alleviated, and that there is a slight decrease in mortality. He quotes in support of this records before and since the introduction of the so-called Brand method. Acute abdominal pain is the first and most marked symptom in perforation; when diminished or absent liver dulness is added to the pain, it is a valuable sign of perforation. Distention of bowels may give this latter symptom. Dr. Finlay believes that the mortality following operative interference is even higher than usually given.

Dr. J. B. McConnell lays emphasis on making the patient as comfortable as possible, and advises small doses of nitro-muriatic acid with a little boric acid and syrup of orange. He thinks the acid may serve as an antiseptic to the upper alimentary tract as well as aid digestion. He advocates the cold bath for combating the fever, eliminating toxins, and reducing hyperleucocytosis, but not until the temperature rises to 104° F. In place of actual immersion he prefers the cold pack, as it causes much less shock and reduces the temperature equally well. When the temperature is lower (102° to 103° F.) cool sponging is sufficient. In intestinal hemorrhage and collapse, restriction of the diet should be continued for several days; camphor and opium are also indicated. A warning is given against lead, which does not stop the hemorrhage from the bottom of an intestinal slough. Ergot the speaker considers harmful. The hemorrhage is usually from lateral eroded vessels, and ergot, being a general vasoconstrictor and increasing vas-

cular tension, adds to the loss of blood through increasing the erosion. He suggests nitroglycerin or any of the nitrites for diminishing the tension. The bacilli are so widely distributed that intestinal antisepsis cannot be of much avail. It is doubtful whether any drug can inhibit the bacilli in the alimentary tract.

Dr. James Bell advises early operation in perforation—within twenty-four hours at the latest and as much sooner as possible. The one contra-indication to operation is collapse; a few hours later the patient may have rallied, and then operation is to be performed at once. He believes the only reliable early symptom is pain, the other classical symptoms occurring too late to be serviceable. If there is any question as to the presence of perforation, it is better to risk operation than to delay.

Dr. Adami believes in mild purgation, to prevent secondary infection from intestinal absorption. He quotes and recommends Owen Paget's method of giving large doses of salad oil—by the cupful, *per os* and *per anum*. It is not irritant, and is taken without objection; the bowels are moved mildly, and it also acts as a food stuff. When the stools have lost their offensiveness it is no longer indicated. At the same time cold baths are to be given, and, possibly, intestinal antiseptics.

Dr. W. E. Weeks objects to cold baths for patients in whom subsequent reaction is not satisfactory. When shivering is kept up for fifteen or twenty minutes he thinks no benefit has been derived from the bath. The cold pack is recommended in severe headache. Phenacetin is temporarily useful. In place of salad oil three or four grains of calomel are recommended, especially when the abdomen is distended and the stomach is full. The sponge bath, with ammonia or alcohol, is usually sufficient to reduce the temperature, and is a satisfactory substitute for the cold bath.

Dr. D. J. Evans recommends the addition of gruels, malted milk, and even beef juice to the milk diet of typhoid patients. He also advocates the cold pack.

Dr. F. R. England recommends, in place of purgation, enemata of glycerin and warm water, which may be repeated frequently.

Dr. Wesley Mills thinks cold water in typhoid fever acts by so affecting the nervous centres that nutrition is in turn benefited, and considers the disease a constitutional rather than local affection. He proposes a more varied liquid dietary, provided no bad reaction follows.

Dr. H. A. Lafleur mentions coffee, tea, thin gruel, egg-nog, clear soups, koumyss, soft-boiled eggs as among the articles of food permitted patients, even at the height of the disease. The urine of patients subjected to cold baths is greatly increased in toxicity, the kidneys being stimulated by the nervous system. Toxæmia is less common in these patients. Lack of delirium is another feature. These are among the advantages of cold bathing. Intestinal antiseptics may be added to the bath treatment.—*The Montreal Medical Journal*, 1899, vol. xxviii., No. 2, p. 96.

[The statement that the urinary toxicity is increased after cold bathing has the advantage in common with other gratuitous hypotheses—that it can be neither proved nor disproved. At present there is no reliable method of measuring the urinary toxicity. Cold baths are, however, certainly diuretic. As for intestinal antiseptics, if these are intelligently used there seems to be no indication for cold bathing.—R. W. W.]

Cured Pulmonary Tuberculosis.—Dr. M. Heitler reported seven instances in 1892. The present patient became ill in that year. In fourteen months he was cured, and has remained so until the present. The disease was bilateral, had progressed to marked consolidation, and was confirmed by the presence of large numbers of tubercle bacilli in the expectoration. Physical signs were entirely absent three years from the beginning of the attacks. The treatment consisted in careful alimentation and residence in a pure air, with persistent use of creosote at the commencement.—*Centralblatt f. die gesammte Therapie*, 1899, Heft. iii. S. 129.

The Treatment of Croupous Pneumonia with Hot Water-bags.—Dr. Kolipinski has had much success with this method, and believes that it is often possible to abort an attack. Early recognition of the disease is important. Each bag should hold one gallon; they are to be placed side by side on the bed with the mouths pointing upward. The bags form a cradle for the posterior scapular regions. Sufficient covering to prevent burning the patient is wrapped around the bags. The external temperature should be about 110° F.; over 120° F. is liable to cause severe burns. The bags should be refilled every three or four hours. This treatment is to be continued without intermission until apyrexia has existed for several days. Liquid diet, preferably milk and cocoa, is recommended. If by the use of heat locally applied hepatization can be prevented, or if already present, consolidation can be cleared up, then internal medication is not indicated, and may even prove harmful.

The writer objects to drugs in general in connection with this method of treatment, and especially interdicts the use of morphine or opium for any purpose. He considers the insomnia not to require treatment, and the cough a valuable indication that the patient will recover. In children and infants treatment with hot water-bags is impossible, and flaxseed-meal poultices are to be substituted. In a series of ten patients there was but one death, and in this instance the treatment was not begun until the disease was fully developed and extending. Seven of the patients were sixty years of age or more. —*Maryland Medical Journal*, 1899, No. 12, vol. xli. p. 179.

Treatment of Pertussis.—Dr. J. Madison Taylor remarks that a variety of measures directed to local cleansing of the upper respiratory passages are powerful in limiting both the progress and severity of the process. Vaccination in those not already protected has been marked by several authors as curative. The remedy which may be safely applied by the mother or nurse is amyl nitrite, 1; spirits of chloroform, 6; ether, 10—of which a few drops may be placed upon a handkerchief, and this held to the child's nose during the paroxysm.—*Pediatrics*, 1899, No. 7, p. 308.

Treatment of Eczema by Picric Acid—Dott. Francesco Radaeli reports upon the use of this substance in 10 per cent. aqueous solution upon twenty-five patients. There was not noted any yellow coloration of the conjunctiva nor changes in pulse-rate or temperature. The urine, however, was diminished in amount and of a yellowish-red color, although no picric acid could be detected in it. Intestinal disturbances and cutaneous eruptions are

classed as symptoms of poisoning, but are frequently susceptible of other obvious interpretation. At all events they were slight and disappeared in a short time. In fourteen of these patients suffering from acute eczema, the results were satisfactory in a short time. Of the other eleven, four showed a marked benefit after application of picric acid used alone, or later alternating with other remedies. Evidently here picric acid had shortened the duration of the disease. In seven instances there was no benefit. Some of these were benefited by moist applications of salicylic acid, while others resisted all methods. In a few instances applications of picric acid seem to aggravate the local conditions, increasing the congestion, œdema, and the number of vesicles. This aggravation, however, rapidly disappeared under appropriate treatment. The following conclusions are offered: 1. This method should be tried in acute eczema and in the exacerbations of chronic eczema. 2. When well borne, and it generally is, after a brief period of smarting the symptoms are relieved. 3. This betterment generally goes on to cure; rarely the benefit is temporary. 4. If not well borne it does not cause severe local disturbance. 5. It appears to act as an antiseptic and keratoplastic agent.—*La Settimana Medica*, 1899, No. 9, p. 97.

Apomorphine.—Dr. E. L. Abogado recommends this, when given hypodermatically, as an excellent emetic. For accumulations of mucus in the respiratory passages or in the chronic catarrhs it facilitates expectoration. It is useful to relieve the dry cough of tuberculosis. Dominguez recommends its use in cerebral congestion when it is desirable to empty the stomach quickly, and for patients suffering from digestive disturbances to tone up the organs.—*Cronica Medica Mexicana*, 1899, No. 9, p. 248.

The Treatment of Diabetic Coma—Dr. Ludwig Herzog believes that before the actual onset of coma, but in the presence of severe symptoms, sodium bicarbonate, in from one hundred and fifty to six hundred grains daily, is indicated. If urgent treatment is required in developed coma the subcutaneous infusion of physiological saline, or 3 to 5 per cent. of sodium bicarbonate, even a stronger combined solution, should be frequently repeated. The unpleasant symptoms observed from the use of sodium bicarbonate are diarrhœa, palpitation, and even bloody urine.—*Berliner klinische Wochenschrift*, 1899, No. 14, S. 295.

Notes on Cocaine—Dr. W. P. Jenney writes that an aqueous solution of cocaine hydrochlorate applied to the skin is in part absorbed, coolness follows, and if a considerable surface has been thus treated physiologically, symptoms appear like those following chewing of cocoa-plant leaves. The quantity of cocaine so applied may be many times the maximum safe internal or hypodermatic dose, still no toxic action results. Local anæsthesia is somewhat modified. Sensation continues in the area treated for twenty minutes or more. Bruises thus painted over soon begin to fade, and discoloration and congestion rapidly disappear through the constriction of the bloodvessels. Pain more slowly subsides, seldom returning after the anæsthetic effect of the drug has ceased. Deep-seated pain requires a larger interval before relief is afforded. In such instances the skin is to be kept

wet with the solution of cocaine until ten grains or more have been applied. Probably the effect is less due to action through the circulation rather than to local absorption. The strength of the solution used should be 2 to 4 per cent.; a fresh preparation is requisite. All absorption ceases if the surface dries. Bruises, sprains, and local inflammations can be thus much relieved. When neuralgic pain is superficial the application of cocaine solution is followed by immediate relief. A 6 per cent. solution is recommended for deep-seated pain in pleurisy, pneumonia, and peritonitis, a gradual palliation following. Marks due to the hypodermatic needle, when painted, rapidly disappear. Absorption of the toxic alkaloids will occur if the skin is broken, and in highly inflamed conditions. There are probably two alkaloids present in the drug as sold. One, rapidly absorbed by the skin, is non-poisonous and reduces local pain and inflammation; the other is not absorbed and remains on the skin surface. This latter is white, solid, intensely bitter, and causes numbness of mucous membranes. The variable action of different samples of the drug may be thus explained, depending on the proportions of toxic and non-toxic alkaloids present. The writer suggests lethane as a name for the toxic alkaloid.—*Medical Record*, 1899, vol. lv. p. 424.

Quinine Dermatopathy.—Dr. Chomatianos reports that an army officer every time that he takes quinine, within six hours erythematous areas, varying in size from a ten-cent piece to that of a dollar, appear on the hands, face, and penis. Later these areas become the seat of bulla, filled with limpid serum. The penis swells as if paraphymosis existed, and muco-pus is discharged as in balanoposthitis. After two or three days the bulla rupture and with the discoloration slowly disappear. These manifestations appear with the first dose of quinine, but once having been established the remedy does not give rise to any symptoms.—*La Grèce Médicale*, 1899, No. 4, p. 29.

Cure of Morphine, Chloral, and Cocaine Habits by Sodium Bromide.—Dr. N. Macleod advises the following: The weight of the patient is to be ascertained, and, no organic disease contraindicating, sodium bromide is to be given in two doses of two drachms in solution every two hours for two days and one drachm during the third day. None is to be administered after bedtime on the third day. Three ounces in all will usually suffice, but more may be given to induce deep sleep, which should last five or six days and nights. During this period nothing but milk is given. Twice a day the bladder and rectum should be evacuated, oftener if necessary. For a week or more following return to consciousness, speech and locomotion, which are very much impaired or impossible on first awakening, gradually improve; the mental condition returns to normal more slowly. Delusions become less frequent and the memory improves. Sleep is often irregular but further treatment is undesirable. Solid food is indicated as soon as asked for. Exercise is desirable as soon as the power of locomotion is recovered sufficiently. Muscular tenderness soon passes off. Morphine may be given in the habitual dose on the first day, halved the second, and very little or none on the third day. Chloral, if there is a good sleep the first night, may be cut off at once. Cocaine may be reduced like morphine. Six weeks should be insisted on for convalescence. Cases cited show: 1. The withdrawal

within three days of the drug causing the habit. 2. Absence of suffering. 3. Impossibility of deception on the part of the patient. 4. No substitution habit results, and the patient loses his craving, whether he wishes to or not. Too few patients have been thus treated to be certain that there is no risk. Nothing, in a series thus treated, points to vascular, respiratory, or alimentary disturbance of a serious nature.—*British Medical Journal*, 1899, No. 1998, p. 896.

Orthoform.—Dr. F. Miadowski reports an unpleasant result following the use of this substance. A varicose ulcer of the leg was treated with a 5 per cent. ointment. After a few days a gangrenous area nearly the size of the palm of the hand was found, which was bluish-black in color, and the skin about was reddened, and burning pains were felt in it. After removal of the ointment and cleansing with lysol the healing progressed rapidly.—*Münchener medicinische Wochenschrift*, 1899, No. 12, S. 282.

Treatment of Rheumatism in Children.—Dr. Philip F. Barbour believes that salicylic acid and the salicylates are not only eliminating agents but also anodynes, and in both of these respects are preferable to opium. Salicylic acid is disagreeable to the taste, and should not be used when even partial deafness exists. Salol, from its contained phenol, may act unfavorably upon the blood and kidneys, and children are liable to an idiosyncrasy toward phenol. Of the salicylates the ammonium salt is preferred, because it is much less disagreeable to take than the sodium salt, and the ammonium tends to counteract the depressing effects of the salicylic acid. It is not nearly so nauseating and may be rapidly pushed. It should be largely diluted with water, in order to more rapidly eliminate the morbific material. In case the salicylates cannot be taken, pain is best relieved by antipyrin, phenacetin, or lactophenin in small doses.—*Pediatrics*, 1898, No. 7, p. 289.

The Treatment of Coryza.—Dr. Max Nassauer regards this malady as due to an infection, and proceeds to cleanse and disinfect the nasal mucous membrane, which is done with a weak (faint rose-colored) solution of potassium permanganate in warm water. This is used in a nasal cup or by other method of irrigation, so that all of the nasal mucosa is reached. The nose is then dried and cleansed with cotton. Finally, the anterior nares are tightly closed with cotton, and the head being thrown back, the posterior nares and regions behind the palate again cleansed. The procedure is finished by allowing cotton moistened in the solution to remain in the nose for an hour.—*Klinisch-therapeutische Wochenschrift*, 1899, No. 1, S. 7.

On Belladonna in the Treatment of Broncho-pneumonia in Children.—Dr. J. A. Coutts writes of his successs in treating a series of cases of this disease with large doses of belladonna, no other medication being required. The free secretion into the bronchial tubes and pulmonary tissues is very markedly diminished. Of several dozen patients so treated only two died. After a few doses of the drug the severe dyspnœa is relieved, and a marked

change for the better ensues. The duration of the disease is also lessened—instead of several weeks, only two or three days elapse before convalescence begins. The writer lays stress on two points: 1. The amount given should be large. 2. The tincture of belladonna is not to be used, for it is unreliable, but preferably the extract. The dose is a quarter of a grain every three or four hours. This dosage applies equally to infants and older children. Disadvantages have been a slight delirium in several instances, easily remedied by lessening the dose. Flushing of the skin and a scarlet rash are not infrequent. Less often noticeable, mydriasis is present.—*The British Medical Journal*, 1899, No. 1987, p. 207.

GYNECOLOGY.

UNDER THE CHARGE OF

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Trophic Disturbances of the Bladder Following Gynecological Operations.—MIRABEAU (*Centralblatt für Gynäkologie*, 1899, No. 11) calls attention to the fact that the vesical irritation so often observed after operation is usually referred to infection or mechanical injury, while in a few instances it has been due to ligatures which have made their way into the bladder. He reports two cases of cœliotomy, with persistent vesical symptoms, in which cystoscopic examination showed general anæmia and atrophy of the mucous membrane, evidently due to circulatory disturbances, the arteries being abnormally small while the veins were prominent. He inferred that the collateral circulation had not been established as usual after ligation of the vesical arteries. In these cases treatment of the bladder itself may do more harm than good. Massage, the separation of adhesions, and softening of exudates in the neighborhood of the organ are indicated. As a prophylactic measure the surgeon should avoid mass-ligatures and ligate the vessels separately as far as possible, sparing those which supply the bladder.

Changes in the Ovaries Attending Starvation and Forced Feeding.—PETROFF (abstract of thesis in *La Gynécologie*, February 15, 1899), as the result of experiments on dogs and rabbits, noted the following interesting facts: When the animals were starved the ovaries presented a normal appearance so long as the body lost only one-tenth of its weight, but when the diminution reached from 20 to 40 per cent. marked changes were observed in both the cortex and the stroma. Foci of fatty degeneration appeared in the cortical layer of epithelium, which advanced even to the stage of necrosis; the same processes were observed in the stroma, though less advanced.

On forced feeding of the same animals after starving them the lesions in the ovaries were more marked for a time, and even increased, but the organs returned to their normal condition after the original body-weight had been

regained. There was never any change in the follicles or ova. Karyokinesis of the cells of the membrana granulosa and internal epithelial layers of the follicle were common both during starvation and during the subsequent process of forced feeding.

Late Recurrence after Amputation of the Cancerous Cervix.—PAMARD (*Congrès de Chirurgie; La Gynécologie*, February 15, 1899) reports the case of a young woman with epithelioma confined to the posterior lip of the cervix uteri. High amputation was performed with the galvano-caustic wire, the disease being thoroughly removed. The diagnosis was confirmed by the microscope. Fifteen years later (!), the patient having remained perfectly well in the meantime, she developed malignant disease on the posterior vaginal wall, which was excised and the wound thoroughly cauterized. The writer adds that, in spite of the excellent immediate results of vaginal hysterectomy, when the disease is limited to the cervix high amputation with the cautery would seem to be preferable.

Ligation of Arteries in the Case of Inoperable Tumors.—TUFFIER (*La Gynécologie*, February 15, 1899) reports seven cases of inoperable carcinoma of the uterus, in one of which the patient lived for over two years after the operation, dying from metastasis. In the others the disease was not arrested, although the hemorrhages and foul discharges were greatly diminished. The operation, in his opinion, is simply palliative.

In three cases of fibromyoma in which the uterine arteries alone were ligated the hemorrhages were arrested, but there was no decrease in the size of the tumor.

Roux tied both internal iliacs several times for the relief of inoperable cancer of the uterus, but the subsequent amelioration of symptoms continued for only a few weeks.

Intra-uterine Injections of Iodide of Alumnol.—LEBEDEFF (*Wratch*, 1898, No. 49) describes the changes in the endometrium following the injection of this drug, as recommended by Grammatikati. Fragments of tissue were removed with the curette for examination both before and after treatment. It was demonstrated that the diseased mucosa was entirely destroyed and the necrosed tissue cast off. After the injections were suspended the healthy mucosa began to be removed until the cure was complete. Gonococci within the uterine cavity were destroyed. In cases in which menstruation had been arrested for several months the periods returned regularly.

The advantage of this method of cauterization over curettement lies in the fact that even after thorough use of the curette islands of diseased mucosa are often left, which serve as the starting-point for fresh disease, since they may contain gonococci and other pathogenic organisms; or the latter may be so deeply situated that they are not removed. Alumnol, on the contrary, acts upon the deeper tissues. Diseased ovaries are often favorably affected by the restoration of healthy endometrium.

Sarcoma of the Uterus.—FRANQUÉ (*Zeitschrift für Geb. u. Gynäkologie*, Band xl. Heft 2) reports sixteen cases which were most carefully studied.

Judging from these and all the other cases reported in literature during the past ten years, he infers that sarcoma of the uterus presents far more variations than does carcinoma, both clinically and anatomically. Giant-cells were found in one-third of his cases. Sarcoma of the endometrium was always of the round-celled variety, while in the uterine muscle it was either spindle-celled or the mixed form. Among his specimens was one of polypoid sarcoma of the cervix, and one of *myosarcoma striocellulare* of the corpus uteri.

He notes the frequent occurrence of hyalin and myomatous degeneration and the greater frequency of sarcoma of the uterine wall as compared with disease of the endometrium. There were three cases of mixed sarcoma and carcinoma.

Remote Results of Vaginal Hysterectomy for Uterine Fibroids.—BUSHBECK (*Archiv für Gynäkologie*, Band lvi. Heft 1) reports the following results in one hundred cases: The mortality was 3 per cent., ligatures being used exclusively. Sixty-five patients who were examined from one to ten years after operation were entirely cured and able to perform their usual duties, being physically and mentally sound.

The writer believes that it is of the greatest importance to make a careful examination of the entire circulatory system in every case of fibromyoma before operating. By the systematic use of subcutaneous injections of saline solution patients who have been greatly reduced from loss of blood can in a short time be enabled to stand even severe operations.

Ultimate Results of Myomectomy.—ABEL (*Archiv für Gynäkologie*, Band lvii. Heft 2) presents a complete record of the abdominal sections for uterine fibromyomata performed by Zweifel from 1887 to 1894. Seventy-one patients were repeatedly examined by the writer during a period of five years, so that he was able to state their exact condition.

Many interesting facts were brought out, among them the behavior of the stump after supravaginal amputation (according to Zweifel's method). Contrary to the opinion of those who advocate total extirpation, in only nine cases did suppuration occur, the patients making a good recovery and presenting no local complications in subsequent examinations. Vesical symptoms were less marked than after hysterectomy. The patients were all able to perform their usual work within three months after operation. The question of vaginitis and contraction of the vagina after supravaginal amputation was carefully studied; the former appeared to be due to mechanical causes (difficult coitus) rather than to an irritating discharge from the cervical canal.

The danger of malignant degeneration of the cervix seems to be so small as to furnish no argument against the operation. According to the writer's observation it undegroes progressive atrophy.

A careful study of the cases in which the ovaries were left after removal of the uterus led to the inference that the glands undergo a more or less rapid atrophy, which results in complete loss of their functions before the natural time of the climacteric. Glaenecke's statement that atrophy of the external genitals is delayed when the ovaries are preserved was not borne out by the more extended observations of the writer. On the other hand, the phenomena observed resembled the normal rather than the artificial climacteric noted

after castration of young women. The average persistence of the menstrual molimen when the uterus alone was removed was eighteen months.

Three patients whose ovaries were not removed presented the interesting phenomenon of more or less regular menstruation after supravaginal amputation, persisting in one instance for five years. The writer concludes that it is better to preserve the ovaries whenever this is possible.

Dermoid and Teratoid Tumors of the Ovary.—KROEMER (*Ibid.*), after a study of twelve specimens, is led to agree with Pfaunenstiel's statement that these tumors are ovulogenous, since they always present evidences of the three embryonic layers. The ultimate cause of their development is still unknown, but it may be assumed that their manner of development is not one of pathogenesis, since the latter is a physiological process. The cleavage of the ovum from which a dermoid develops is pathological. Only the earliest portions of the embryo develop, hence the prominence of the ectoderm and cephalic end, while the remaining portions either do not develop at all or are deformed. The differentiation is one-sided, and is sometimes confined to a single organ, such as a breast. In connection with this subject the question of the differentiation of sex in the ovum presents a suggestive field for future study, though the expectation of affecting this result, as claimed by Schenck, may be dismissed as vain.

Chloride of Zinc in Chronic Metritis.—DELBET (*Annales de Gyn. et d'Obstétrique*, 1899, No. 1) reports sixty-two cases treated by injections of chloride of zinc varying in strength from 30 to 40 per cent., the number in each case varying from 3 to 8, given at intervals of from two to fourteen days. Although the writer is skeptical regarding the danger of forcing the fluid into the peritoneal cavity (as was claimed in a fatal case of Hofmeier's), he nevertheless advises that due care be exercised to avoid this accident.

The injections are often painful, especially at first, and transient syncope has been observed, but no permanent ill effects were noted. The best results were obtained in hemorrhagic endometritis. Of twenty-six patients belonging to this class twenty-two were cured. In one the hemorrhage was so persistent, in spite of curettement, that the uterus was extirpated, but no lesion was found sufficient to explain the symptoms. In glandular endometritis eight cures were obtained in fifteen cases. In six in which the adnexa were diseased only three were cured.

Capillary Drainage in Puerperal Endometritis.—GOUZARTCHIK (*Ibid.*) describes the following method of treatment pursued successfully in 114 cases: The cervical canal is swabbed with bichloride solution, 1 : 200, after which the uterine cavity is disinfected with the same solution, applied on cotton, and is thoroughly dried. A tampon saturated with 1 : 1000 bichloride is then introduced into the cavity, and is allowed to remain for a few minutes, when the excess is removed with a dry swab. The uterine cavity is then tightly packed with iodoform-gauze wrung out in a 2 per cent. solution of carbolic acid, after which the vagina is tamponed. The intra-uterine tamponade is repeated at the end of from twelve to twenty-four hours, and this procedure is repeated until a cure is obtained, five treatments being the

average number. Out of 115 patients thus treated only one succumbed to septicæmia. The temperature usually fell after the first tamponade, and often reached normal within a day or two. Parametritis developed in a single instance. The average stay of the patients in the hospital was only two weeks after the delivery. The best results are obtained in cases in which the adnexa are not affected.

OBSTETRICS.

UNDER THE CHARGE OF

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Intra-mortem Cæsarean Section.—In the *Prager med. Wochenschrift*, 1899, No. 17, SCHICK reports a case of a patient in pregnant condition who was supposed to have a tumor of the brain. She had borne children, and suffered greatly from pain in the head and other cerebral symptoms. She died undelivered, in collapse, with cyanosis.

It was deemed advisable to deliver the fœtus by Cæsarean section, as labor had progressed so little that the uterus could not be rapidly dilated. The mother was so far advanced in coma that she required scarcely any anæsthesia. The child was delivered alive without difficulty, the usual operation being performed, and the uterus carefully sutured and left. The mother perished very soon after operation, and tubercular meningitis at the base of the brain was found to have caused her death. The child survived its delivery.

The Treatment of Asphyxia in the New-born.—KNAPP (*Prager med. Wochenschrift*, 1899, No. 17) concludes that in the mild forms of asphyxia it is well to delay tying the cord until mucus has been removed from the trachea, or until rhythmical contractions have been made upon the tongue. If the child does not breathe the cord should be at once tied and the skin irritated in some gentle manner.

In the severe form of asphyxia the cord should be at once severed and artificial respiration promptly performed. The child should be frequently put into a warm bath and rhythmical contractions made upon the tongue.

When, in addition to asphyxia, the child is profoundly anæmic, injections of normal salt solution should be made.

Measles Occurring During Pregnancy.—In the *Prager med. Wochenschrift*, 1899, No. 17, SALUS reports a case of typical measles occurring in a pregnant woman, during which labor came on spontaneously, a living child being

born. Hemorrhage from the cord occurred soon after birth, which ceased when the vessels were separately tied. The mother had a very slight rise of temperature, but otherwise made an uninterrupted recovery. The child had no symptoms of the disease.

On examining the placenta it was of normal size and showed no essential change in its structure. On the maternal aspect were collections of extravasated and clotted blood. The same appearance prevailed upon the membranes, the clots having somewhat the appearance of very small placental lobes. One of them was as large as a hen's egg. On microscopical examination these were found to be caused by bleeding into the spongy layer of the decidua.

The Treatment of Abortion.—In the *Monatschrift für Geburtshülfe und Gynækologie*, 1899, Band ix., Heft 5, LANTOS contributes an interesting paper under this title. He limits his cases to those in the first three months of pregnancy, and naturally divides them into threatened and complete abortion. His cases numbered 300, and in them he recognized as the principal complications bleeding and septic infection.

His treatment consisted in thoroughly emptying the cavity of the uterus unless he had positive evidence that all of the ovum had been discharged. Thus in 246 cases the uterus was emptied with the finger; in 4 with placental forceps, and in 50 with the curette. On examining these patients in 184 the finger could be introduced into the uterus; in 24 only the finger tip, and in 10 two fingers, while in 32 it was impossible to introduce the finger. Nineteen of these cases were complete spontaneous abortion. Two hundred and eighty-one were incomplete.

In the 19 cases of complete abortion 17 made good recoveries without interference. The pregnancy in these cases did not exceed the second month. In 15 the uterus was easily emptied with the finger, while in 4 chill and fever called for the complete cleansing of the uterus, and in 3 of these patients the temperature immediately and permanently fell. One of these cases ended fatally from septic infection; this was the only fatal case in the 300.

Of the 281 incomplete abortions, in 221 the entire placenta or part of it was retained. In 60 portions of decidua were left behind. The finger was successful in removing the placenta 216 times. In 4 patients the placental forceps was employed and in 1 the curette. Retained decidua was removed 49 times with the curette and 11 times with the finger.

The chief indication for active interference in incomplete abortion was bleeding, and of 196 cases of this complication 195 were promptly controlled by emptying the uterus with the finger. In one of these patients it was considered necessary to inject a preparation of iron to stop the bleeding. In two of these fever occurred. One of these patients had an exudate in the pelvis at the time of abortion. The other had scarlatina, followed by a pelvic exudate, but both recovered. In the cases in which the abortion was completed because of the fever the cervix was usually found partly open. Most of these cases did well as soon as the uterus was thoroughly emptied and disinfected.

The cases of curetting, fifty in number, had bleeding as an indication in forty-four, and fever in six. In all of these the curetting was promptly

effective. For washing out the uterus lysol was used in patients who had no fever, and in those who had, a weak solution of bichloride of mercury was employed.

None of these cases were anæsthetized. The writer succeeded by manipulation in pressing down the uterus so that the finger could be introduced. The after-treatment consisted in liquid diet, cold applications to the abdomen, moving the bowels freely, and cleansing the external parts with an antiseptic, and limiting vaginal douches to those patients who had fever.

The writer sums up his experience in a series of formal conclusions, of which the following are the most important: When the os is but little if at all dilated, bleeding is not an important complication, and may be treated by rest in bed and by vaginal douches. When considerable bleeding occurs it is impossible to stop the abortion, and treatment should be selected accordingly. Bleeding which persists after an abortion points to the retention of some portion of the ovum in the uterine cavity. As regards the importance of vaginal tampons in these cases, they do not prevent abortion, but their use favors it. When the uterus is empty, as a rule, the cervix closes. When, however, the cervical canal is partially open and bleeding is present, it is good evidence that the womb has not been emptied. In cases of complete abortion, when neither the ovum nor the appendages are retained, interference should not be practised except for some serious complication. In incomplete abortion, however, interference is imperative. The use of the intra-uterine tampon of gauze is most successful in cases of hemorhage where the cervix dilates but little. As a rule, however, the more rarely an instrument or finger is introduced within the uterine cavity the better for the patient.

The finger is preferable in recent cases of abortion wherever it can be introduced. When, however, the case has persisted for some time, and the cervix is closed, gauze should be employed as a tampon until dilatation occurs, when the placenta is expelled, after which the uterus should be curetted. It is seldom necessary to dilate the uterus for curetting in cases of abortion. It is always better to curette or to empty the uterus with the finger rather than to employ intra-uterine douches. After the womb has been so emptied bleeding should not be present, and its persistence points to the retention of some portion of the ovum. As a general rule, active treatment of abortion is prophylactic, because it prevents hemorrhage and infection. If the expectant treatment be followed the patient is exposed to bleeding, anæmia, fever, and retention of decidual and placental tissues and chronic endometritis. The danger of active treatment arises only when the operator is not aseptic in his methods. In all cases of septic infection complicating abortion, where either the whole or part of the ovum is retained, the uterus should be emptied as soon as possible and cleansed with bichloride solution. Where septic infection persists after abortion the total removal of the uterus, tubes, and ovaries is indicated.

The Frequency of Contracted Pelvis Among American Women.—In *Obstetrics*, 1899, vol. v., No. 5, WILLIAMS reports the examination of 1000 patients, of whom 469 were negroes. Among the entire number pelvic contraction was found in 13.1 per cent., which corresponds very closely with the

general average observed in Germany. Pelvic contraction is 2.77 times more frequent in negro than in white women. Among white women in America, contracted pelvis occurs in 7 per cent., which is as frequent as in many German cities, in Paris, and more frequent than in Vienna. The necessity for pelvimetry becomes evident if these results are taken into consideration.

Inversion of the Uterus Occurring After Labor.—In the *Wiener klin. Wochenschrift*, 1899, No. 16, BRAUN describes the case of a primipara, aged twenty-four years, of feeble development, who was delivered spontaneously of a large child, and in whom retention of the placenta made curetting necessary. She recovered from this labor, and in her second pregnancy the presence of twins was diagnosticated. They were delivered spontaneously, as were the placenta. No pressure was made upon the uterus nor traction upon the umbilical cord. The womb, however, became suddenly inverted, and profuse hemorrhage occurred. The uterus was at once replaced and packed with iodoform gauze, the patient making a good recovery. In the absence of manipulation this case seems to illustrate the influence of a feeble and relaxed condition in determining inversion of the uterus.

The Technique of Cæsarean Section.—In the *Wiener klin. Wochenschrift*, 1899, No. 16, ROSSA reports two cases of rhachitic pelvis in which delivery was accomplished by Cæsarean section, employing the transverse incision across the fundus, as recommended by Fritsch. In both the patients made good recoveries, the operations being entirely successful.

Adhesion of the Membranes as a Cause of Delayed Labor.—In the *Centralblatt für Gynäkologie*, 1899, No. 19, LÖHLEIN draws attention to the fact that in some cases where delay in labor is thought to be due to deficient contraction of the uterus it is really caused by adherence of the membranes to the lower portion of the uterus. He could detect but fifteen of these cases in 3000 births, or 0.5 of 1 per cent.

The diagnosis was made by introducing the finger and sweeping it about the internal os, when it should move freely about the uterus and the membranes. If adhesions of the membranes can be readily separated labor will promptly go on. If, however, this fails the membranes should be ruptured, when the delay will cease. He describes two typical cases which illustrate his statements.

Cæsarean Section with Fritsch's Transverse Incision.—In the *Centralblatt für Gynäkologie*, 1899, No. 19, a number of cases of this operation are reported by four different operators.

THUMIN, in Landau's clinic in Berlin, reports a successful case of Cæsarean section delivered by Fritsch's transverse incision. The stitches passed through the decidua in this case, but no complications resulted.

BRAITENBERG, in the clinic at Innsbruck, reports a case operated upon by Ehrendorfer. In this patient the incision came directly across the fundus upon the placenta, which was attached at this point. No dangerous loss of blood followed, however, and the operation was brought to a conclusion with-

out difficulty. Ergotine was injected during the operation. Mother and child made a good recovery.

SEIDENTOPF, of Magdeburg, reports three operations, two performed by himself and one by Dahlmann. In the first case the operation proceeded smoothly. A few days afterward the temperature rose and the lochia was found to have ceased. This returned after an intra-uterine douche In case second labor had progressed so far that the contraction ring was plainly present. No difficulty, however, was found in delivering the chid. The uterus did not contract; profuse hemorrhage occurred, but ceased upon packing the womb with gauze and bringing the end of the gauze out through the vagina. The patient finally made a good recovery. In case third cancer of the cervix was present and the case was inoperable. The child was delivered by the transverse incision into the uterus and survived the operation. The mother's convalescence was retarded by suppuration in the abdominal wound, which was thought to have been caused by her frequent coughing. From this, however, she recovered, although nothing could be done for the cancer.

PERLIS reports from the hospital in Kiew, Russia, the case of a pregnant patient who had cancer of the uterus. She was too far advanced for a radical operation, and accordingly she was placed in Trendelenburg's position, the abdomen opened, and the uterus opened by transverse incision of the fundus. She was delivered of a living child and recovered completely from the operation.

OTOLOGY.

UNDER THE CHARGE OF

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Gunshot-wounds of the Ear.—T. ROSATI (*Ann. des mal. de l'Oreille*, p. 166, August, 1898) concludes, after numerous experiments, that, on account of the extraordinary resistance of the temporal bone, pistol balls penetrate with great difficulty as far as the cranial cavity. In most instances surgical intervention for the discovery of the ball is full of difficulties, not only on account of the uncertainty of the point of arrest of the projectile, but also because of its altered shape and the serious condition of the wounded. If no obstacles exist the ball should be removed at once. Radiography has not furnished any aid to the writer in searching for projectiles lodged in the cranial bones. The organ of hearing is always more or less seriously injured by such wounds. Usually total and permanent deafness is the result.

Artificial Closure of Cicatrized Perforations of the Membrana Tympani.—A. DE SIMONI (*Ann. des mal. de l'Oreille*, August, 1898, p. 160) has employed with success trichloroacetic acid applied to the cicatrized edges of perforations in the membrana tympani, in order to bring about their closure. He subjected twenty-one patients to this treatment in Gradenigo's public clinic in Turin, but was only able to follow out the treatment in fourteen. Of them eleven were healed and three were still under treatment. Great care must

be exercised not to allow the acid to reach any part but the edges of the perforation, as entrance of the acid into the drum-cavity is extremely painful.

Treatment of Acute Otitis Media.—S. C. LARSEN (*Archiv f. Ohrenhr.*, November 30, 1898) has made some very interesting and valuable investigations concerning the treatment of acute otitis media occurring in sixty-five previously healthy soldiers in the Garrison Hospital in Copenhagen. His object was to find out the treatment of middle-ear suppuration, after perforation of the membrana has occurred, which will prevent complications and bring about healing of the ear most quickly. Inflations of air into the tympana as well as insufflations of antiseptic powder in the ear were excluded in all cases. The patients were divided into four classes, viz.:

1. Those not placed in bed and treated without antiseptic instillations ($\frac{1}{2}$ to 1000 bichloride). 2. Those not placed in bed and treated with the antiseptic instillations. 3. Those placed in bed and not treated with instillations. 4. Those placed in bed and treated with instillations. In all cases the ears were mopped out and then stopped with sterilized absorbent cotton.

The duration of the disease does not seem to be much if at all influenced by remaining in bed; but remaining in one's room until suppuration ceases seems to shorten the disease.

The duration of the acute suppuration was six days less in those patients treated without instillations than in those treated with instillations, external relations being equal. This is a specially important conclusion, inasmuch as Larsen began his observations with the belief that antiseptic instillations in the ear in acute otitis media were of service. Respecting the duration of the disease, the advantage was decidedly in favor of the "absolutely dry treatment with sterile cotton tampons." Those cases in which prompt paracentesis was performed healed more rapidly than those in which spontaneous perforation occurred. Fetor of the discharge set in only in those cases treated with the antiseptic drops. Granulations sprang up in eight cases, seven of which were treated with antiseptic drops in the ear and one by the dry method. Prolapse of the mucous membrane of the drum-cavity in five cases, none of which was treated by the dry method. Acute mastoiditis occurred only in cases treated by instillations in the ear.

The absolutely dry treatment, with sterilized cotton tampons, decidedly prevents complications, but it does not appear that remaining in bed has any influence either way upon the production of complications.

Chronic Suppurative Otitis Media in a Tuberculous Patient; Abscess of the Brain; Trepanation by Way of the Mastoid.—M. COVILLE and E. LOMBARD (*Ann. des mal. de l'Oreille*, etc., November, 1898) have recorded their observation of a case of abscess of the brain which they were able to open and drain by way of the mastoid and middle ear. Classical symptoms of brain abscess were wanting in this, excepting diffuse headache and intellectual hebetude. The temperature and pulse, contrary to the rule in such cases, were markedly above normal. The first operation, trepanation of the mastoid only, gave no relief. The temperature and pulse remaining unaltered, it was decided that there yet remained an unopened collection of pus in the brain. At the second operation, three days later, the antrum, aditus,

and attic were exposed according to the method of Stacke-Zanfal. As the bone was found altered in appearances in the tympanic region, the aditus and the inner parts of the antrum, the tegmen tympani was cautiously opened into the cranial cavity and the dura then exposed over an area the size of a dime. The dura was then found to be congested and friable. Suddenly in the front part of this opening in the bone a thin stream of pus was seen to escape. Puncture of the dura now led to escape of pus from the cavity of an abscess in the brain, 2 to 3 cm. in depth. A small drain was then introduced into the abscess-cavity, and the wound was tamponed with iodoform gauze. On account of the weak condition of the patient he was given an injection of 1500 grammes of artificial serum. The next day the patient was free from hebetude and headache, and expressed himself as being very comfortable. However, symptoms of general metastatic pyæmia set in, and the man succumbed about two weeks after the last operation. He was far gone in phthisis when brought to the hospital for treatment of his head symptoms.

The Electric Lathe and Burr in Operations on the Mastoid and Petrous Portions of the Temporal Bone.—E. LOMBARD (*Ann. des mal. de l'Oreille*, September, 1898), after numerous trials, has formulated the following conclusions regarding the use of the electro-motor burr in operations on the mastoid and petrous parts of the temporal bone: 1. It is more exact. It does not slip as easily as the chisel and gouge, and if it does slip the result is not serious. 2. There is no risk of wounding parts that should be carefully protected, as the facial nerve, the semicircular canal, the sinus, and the dura. If one of these organs is reached the spheroidal form of the burr pushes the tissue ahead of it without cutting or wounding it. In breaking down the wall of the aditus with a burr the surgeon may dispense with the protector and almost with the probe. 3. The shock of the blows from the mallet is avoided. 4. The operation is more rapid, a fact not to be despised in an operation always long if it is to be complete. 5. The cavity made is smooth; no angles, asperities, or scales. 6. If the apophysis is eburnated, which is not uncommon in cases of chronic purulent otitis media, the burr is always successful if properly used with sufficient force. Lombard thinks the burr is specially useful in separating the sinus wall from its osseous canal. Overheating of the burr is prevented by the necessary pauses in the operation.

Thiersch's Transplantation of Flaps After Mastoid Trepanation.—KARL REINHARD (*Archiv f. Ohrenh.*, November 30, 1898) maintains that in cases in which all diseased tissue has been removed from the exposed mastoid and middle-ear cavities, after a radical operation for that purpose, transplantation of skin-flaps from the arms and legs will be followed by epidermization of the wound much more rapidly than by the method of tamponing. Transplantation of skin-flaps is, as Reinhard says, very difficult and often fails. He states that even in cases in which the flaps have all failed to adhere "that it will be found that beneath the detached flaps small gray-white points will be found from which, as secretion diminishes, cicatrization (skin) takes place."

[We cannot suppress the thought that in such cases epidermization would have occurred without transplantation of skin from the skin tissues of the region about and in the wound cavity.—ED.]

Experimental Results of Poisonous Doses of Quinine and Salicylic Acid Upon the Auditory Apparatus of Animals.—KIRCHNER (*Berliner klin. Wochenschrift*, 1881, No. xci.) claimed that doses of from one to two grammes of quinine and from three to five grammes of salicylate of soda, given to cats, dogs, and guinea-pigs, produced in a few hours hyperæmia and hemorrhages in the middle ears, the internal ears, and fourth ventricle. The large doses of quinine killed cats and dogs in from five to eight hours, death being ushered in with symptoms resembling those of suffocation. The objection was soon raised to his conclusions that the results in the ears, on which they were based, were due to strangulation and not to the poisonous effects of the drugs given the animals.

C. GRUNERT (*Archiv f. Ohrenh.*, November 30, 1898) has recently made some experiments on white mice and pigoens in order to determine whether "suffocation could produce destructive changes in the auditory organ similar to those produced by Kirchner's poisonous doses of quinine, etc."

By these experiments with suffocation Grunert could produce hyperæmia of the auditory organ but not extravasations, whereas Kirchner evoked by his experimental drugs not only great hyperæmia but extensive blood extravasations in the endolymphatic spaces, functionally the most important spaces in the auditory apparatus. Grunert, therefore, believes that the "above-named extravasations of blood in the ductus cochlearis, for example, as produced by Kirchner, must be the result of specific, poisonous action of the drugs, induced, perhaps, through the great injury sustained by the blood-vessels of the tract under consideration."

A practical conclusion drawn by Kirchner and confirmed by Grunert is that if the internal ear is unduly congested by an overdose of quinine or salicylic acid it can never recover its function. [Caution demands the avoidance of large doses at a time to the human being.—ED.]

Acute Otitis Media.—In the acute inflammatory stage of otitis media, GORHAM BACON (*New York Polyclinic*, January 15, 1898) holds that it is important to apply the artificial leech at once, close to the tragus, and endeavor to abort the disease. If the drumhead bulge a free incision should be made into it. This should be done only under the guidance of the eye and with the aid of good illumination. If the free incision is not made and proper drainage not established there would be great danger of the otitis media becoming chronic. If the disease become chronic in the attic, the perforation should be enlarged and the endeavor made to wash out the secretion with a syringe. Granulations should be destroyed by the application of chromic acid or by the use of the curette. If this treatment failed a cure could be effected in many cases by excision of the ossicles and curetting the attic. Some of the results of chronic otitis media are the formation of granulations and polypi, caries of the ossicula and temporal bone, mastoid disease, suppurative meningitis, cerebral abscess, and septicæmia. In cases of acute otitis media, if the temperature remains high after the incision of the drum membrane and the opening of the mastoid cells, one should think of a complicating pneumonia or, perhaps, of a sinus thrombosis. In cases of acute mastoid disease the operation should not be deferred until redness and œdema of the tissues over the mastoid appear and the auricle stands

out prominently from the head. In making the diagnosis the two mastoid processes should be compared, as in some persons pressure on an uninflamed mastoid process causes pain. In the first stage of mastoid inflammation, secondary to acute suppurative otitis media, after incision the artificial leech should be applied and also the Leiter cold coil; but the latter should not be left on for more than forty-eight hours, for if the symptoms have not subsided by that time immediate operation is indicated. The incision should be made close to the auricle, from the tip to the upper border of the pinna. This incision can be enlarged in both directions if complications exist. When pus is found in the antrum and upper part of the mastoid it should be remembered that the tip might contain pus, and if this is not liberated it may burrow down into the tissue of the neck and give rise to septicæmia. When caries of the tympanic roof takes place a collection of pus is frequently found in the temporo-sphenoidal lobe.

A. H. BUCK (*New York Polyclinic*, January 15, 1898) said with the early stage of acute otitis media one must choose between hot and cold applications. In his opinion, both of these agents are vasomotor stimulants, and they relieve the pain through this vasomotor action by diminishing the pressure on the sensory nerve-fibres of the inflamed part. Heat had no power to benumb sensation, while cold would do so when carried beyond a certain point. This very application of cold, therefore, served to mislead us, for it is largely by the persistence of pain that we are informed of the necessity of going further and operating. The application of ice appeared to be getting very popular in this country, and for this reason he felt called upon to emphasize the fact that it was a very deceptive agent. ROBERT ABBE (*New York Polyclinic*, January 15, 1898) said that the discussion on Dr. Bacon's paper on "Suppurative Otitis Media and its Complications" had shown most clearly the great risk of allowing a purulent otitis to go on after the onset of serious symptoms. Hemorrhage, sinus pyæmia, and cerebral abscess were the great dangers to be feared. If the mastoid was operated upon quite early the involvement of the sinus would be exceedingly slight. If, however, the operation was deferred, the signs and symptoms of sinus pyæmia would soon make their appearance—tenderness and induration along the jugular vein.

PATHOLOGY AND BACTERIOLOGY.

UNDER THE CHARGE OF

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The Action of Streptococci and of Their Toxins on the Various Organs of the Body.—The whole number of *Ziegler's Beiträge für pathologischen Anatomie*, 1899, Band XXV., Heft 1, is devoted to a study by HOMÉN and his

pupils of the effect of one particularly virulent streptococcus and of its toxin on various organs of the body. The toxin was obtained in concentrated form from bouillon cultures by precipitation, either by ammonium sulphate or by amyl alcohol. The results are briefly as follows:

Nervous System (Homén and Laitinen). A parallel series of experiments was made on rabbits, of which about three hundred were used. Injections either of the streptococcus or of its toxins were made into the right sciatic nerve or into the cord. The clinical symptoms varied greatly and were carefully noted. More or less paralysis of the hind leg was frequent, and in cases that lived a long time atrophy of the leg sometimes occurred.

In animals that died within a week after inoculation in the sciatic nerve with the streptococcus the nerve was usually deeply injected, swollen, and œdematous. In cases that lived longer the lesions were less marked. After injection of the toxin the mascroscopical changes were exceedingly slight.

Microscopical changes were usually found in the nerves, nerve-roots, spinal ganglia, and cord.

In the peripheral branches of the nerve-bundle the bacteria seemed from the beginning to be scattered rather diffusely in the nerve substance; in the proximal portion, however, within a very few centimetres above the point of inoculation, they were collected chiefly in the lymph space on the inner side of the perineurium, from which they penetrated gradually into the centre of the nerve-bundle along the endoneural continuations of the perineural sheath.

In the extension to the cord the organisms seemed to travel more along the posterior nerve-roots. In general they then spread very quickly throughout the intermeningeal spaces of the whole cord, collecting chiefly around the nerve-roots, and penetrated also the corresponding spaces of the brain. They got into the cord, especially along the posterior septum, but also at other points, chiefly along the pial sheaths of the bloodvessels. It is worthy of notice that lesions caused by the bacteria were sometimes localized in the neighborhood of the anterior nerve-roots, especially at the anterior edge of the anterior horns.

A week after the inoculation, sometimes earlier, no bacteria, as a rule, could be found in the cord, but they could sometimes be found as late as the seventeenth day in the injected nerve, usually, however, in a degenerated condition.

The histological lesions were closely associated with the localization of the bacteria. The effect of the bacteria, that is, of their toxins, was a diffuse change resulting in granular degeneration, followed by cellular increase due to immigration of leucocytes, and proliferation of the cells of the endoneurium and of the nerve-sheaths.

On the whole, the bacteria do not penetrate much into the spinal ganglia. The ganglionic cells showed the greatest variations in the degenerative changes of the chromophilic elements. Bacteria and pathological changes were found in general more in the posterior than in the anterior nerve-roots.

The most noticeable lesions in the cord after injection of bacteria into the nerves were the localized changes at those places where the bacteria were also sometimes found, and also the changes in the cells of the anterior horns.

It is remarkable that the distribution of the bacteria and of the lesions was practically the same, whether the injection had been made into the nerves or into the cord.

After injections of the toxins the changes on the whole were the same whether the injection was made into the cord or into the nerve.

The changes in general, as well after the injection of the bacteria as of toxin, were at first more of a degenerative nature, and were followed by inflammatory and sclerotic processes; at times the process from the beginning was more of an exudative nature.

Aside from the small differences in the histological changes and in their distribution, the lesions which occurred after injection of bacteria or of the toxin were in general so alike that it must be assumed that the chief paths of distribution of the bacteria and of the toxin are essentially the same, and that the bacteria produce their effect chiefly through their toxin.

The writers are of the opinion that their investigations to some extent favor the view that many affections of the cord—not only those of a more degenerative but those of an inflammatory character—are of an infectious or toxic nature. They believe that their work furnishes an anatomical foundation for the theory of ascending neuritis.

LIVER. BJÖRKSTÉN presents a series of cases showing the action of streptococci and their toxins in the liver.

He injected the liver in five different ways: directly into the liver, into a vein, subcutaneously, into the sciatic nerve, and by introducing a glass tube into the common bile-duct.

In order to infect the common bile-duct thoroughly a laparotomy was performed, with complete aseptic precautions, the duodenum opened, a small sterile glass tube introduced into the bile-duct, the duodenum closed, and the tube broken.

In direct injection into the liver most cases died of peritonitis and general infection. Those which did not die were killed at 1, 4, 10, 30, and 60 days after the infection.

In most of the cases there was a rise of temperature lasting from three to ten days, and considerable loss of weight.

After injection of the streptococci he found that in the cases of general infection, independent of the methods of injection, streptococci were found in the liver in those dying early, but not in those dying after the thirteenth day; they were between the liver-cells or in the capillaries; the parenchymatous cells near the clumps of bacteria, within a few days after the infection, were very often changed; round-cell infiltration and necrotic areas often occurred, and sometimes hemorrhages irrespective of these areas. The liver could be infected with streptococci through the common bile-duct without marked general infection. The streptococci in those cases so infected and examined within thirteen days could be found in and about the bile-passages, together with small-cell infiltration and often degenerative changes in the surrounding parenchyma cells.

After injection of the streptococcus toxin the general condition of the animal was impaired; there was a rise of temperature, and then the animal recovered or grew worse, according to the method of infection. Direct injection caused marked degenerative changes in the tissue.

Injection of the toxin through the common bile-duct caused degeneration and breaking up of the parenchyma surrounding the bile-passages. A loose and swollen connective tissue was formed, in the meshes of which fragments of broken-down liver-cells were often seen. There were also many round-cells and marked increase of the connective tissue cells, especially in the region near the bile-ducts. The meshes of the connective tissue stroma became gradually smaller and finally disappeared, so that a complete cirrhosis might result. Small areas of degeneration or necrosis could be caused by the injection of the toxin into the sciatic nerve or into a vein.

LUNGS. SILFVAST found that streptococci introduced into the lungs of rabbits were immediately taken up in large numbers by the epithelial cells. Fifteen minutes after the intratracheal injection of a bouillon culture numerous alveolar epithelial cells were studded with streptococci. The polymorphonuclear and large mononuclear leucocytes were less phagocytic. After the first four hours more extracellular cocci were seen, and they appeared better preserved. After the second day the micro-organisms began to degenerate, and by the twelfth day cultures from the lung were sterile.

Streptococci were found in the bronchial lymph-nodes fifteen minutes after the introduction of the organisms into the trachea. They were also demonstrable thirty-five days later.

The lungs of the rabbit were quite resistant to the action of the streptococcus. Exposure of the animal to a low temperature, or a local cooling of half the thorax, had a remarkable effect in diminishing this resistance. The inhalation of a mechanical irritant, such as powdered charcoal, had a similar predisposing action.

Both living streptococci and their toxins caused diffuse and focal changes. The pathological process began with the emigration of polymorphonuclear leucocytes, the desquamation of alveolar epithelium, and the exudation of a coagulable fluid. Later there was a diffuse infiltration consisting of various kinds of leucocytes, swollen epithelial cells, red blood-corpuscles, and a granular exudate. The alveolar structure became obscured. Finally, with the continued administration of the toxin, the affected areas became transformed into connective tissue.

HEART (TALQUIST). About fifty hearts were examined by transverse and longitudinal sections, stained principally by hæmotoxylin and eosin, and by Van Gieson's method. No fresh examinations were made.

By the injection of bouillon cultures of the streptococcus directly into the heart muscle pericarditis resulted in nearly all cases. Most animals died in two to three days. In the heart muscle small abscesses developed in some cases. In other cases there were small foci made up of necrotic muscle fibres and much round-cell infiltration. In these foci were numerous cocci. Vascular infiltration was marked and small hemorrhages frequent. Later the formation of fibroblasts was observed. Simple parenchymatous changes were not common. In a rabbit which recovered, and was killed after a month and a half, repair with abundant formation of connective tissue was observed. The foci in the heart muscle were often due apparently to direct extension from the pericarditis, but in many cases isolated foci were found in deeper portions of the wall and in the papillary muscles.

After injection of bouillon cultures into the ear-vein changes in the heart

muscle were quite constant. After twenty-four hours cocci could be seen in large numbers between the muscle fibres, and this was soon followed by destruction of the muscle fibres and round-cell infiltration. Marked vascular hyperæmia was common. In some cases hyaline degeneration of muscle fibres and proliferation of muscle nuclei were seen. In later stages diffuse interstitial changes occurred. There was slight evidence of fatty degeneration.

Subcutaneous and intraperitoneal injections, and injections into the sciatic nerve, produced changes similar to the above. In several of the cases acute pericarditis and endocarditis occurred.

After the injections of the toxins into the ear-veins, even in cases with increase of temperature and loss of weight, the heart muscle frequently remained normal. Changes which did occur were parenchymatous in nature, consisting in granular changes in the fibres and in fatty, hyaline, and waxy degeneration. In later stages interstitial changes were sometimes seen.

The left ventricle and intraventricular septum were the parts most frequently affected.

KIDNEYS. VON BONSDORFF presents experimental investigations on the elimination of streptococci by the kidneys. He injected twenty-four-hour bouillon cultures into the ear-vein or peritoneal cavity of rabbits, and endeavored to find how soon the organisms were present in the urine, and if any constant relation existed between the appearance of cocci in the urine and structural changes in the kidney.

The appearance of cocci in the urine was not constant. The shortest time was nine and one-half hours after injection. In five cases, with a fatal result after a period varying from seven to fifty-five days, the urine was sterile throughout. In a few cases the cocci were present for a few days and then disappeared. As a rule the colonies increased in number with the progress of the case.

Microscopical examination showed in some cases, in the outer parts of the cortex, slight desquamation of epithelium, with nuclei somewhat contracted. In older cases there occurred a slight fatty degeneration, especially in the epithelium of the loops in the upper part of the medulla. Before the fifth day, and in control sections, fat was never found here. Cellular infiltration and frank nephritis were not observed.

In those cases in which streptococci were found in the kidney by culture they were usually present in sections as well. They were found most often in the tufts, less often in the intertubular capillaries, and only very rarely within the tubules; not at all in the capsular space.

These results are too few and incomplete to settle the question as to whether bacteria can pass through normal kidneys. In the first few hours after injection there is no elimination of bacteria. This points to certain antecedent changes in the kidney.

PERITONEAL CAVITY (WALLGREN). The same virulent organism used in the preceding experiments was injected into the peritoneal cavity, and the changes produced were followed by aspirating fluid from the cavity at various intervals of time. In most of the experiments the animals died from a general infection.

The writer sums up his results as follows:

Virulent streptococci, injected even in rather small quantities into the peritoneal cavities of rabbits, can produce a fatal peritoneal infection even when the animal is not particularly susceptible.

If virulent streptococci are injected in doses below a certain minimum the peritoneum can get rid of the organism, but the abdominal wall usually becomes infected around the site of inoculation.

Streptococci of slight virulence do not develop in the peritoneal cavities of rabbits, even if present in large quantities, provided the fluid injected with them is small in amount.

The peritoneal cavity is protected chiefly by its great power of absorption, by the activity of the leucocytes in and immigrating into it, and possibly also by the function of the endothelial cells of the peritoneum.

The leucocytes aid in the battle against the streptococci by phagocytosis, by their products of degeneration, and, perhaps, also, by their secretions.

In experiments with virulent streptococci, phagocytosis occurs at the beginning of infection, is almost lacking in the following stage, when the streptococci have acquired the power to keep the leucocytes at a distance, but can return again later, apparently when the leucocytes begin to break down more rapidly.

In experiments with streptococci of slight virulence, phagocytosis persists uninterruptedly the whole time, so long as streptococcci are present in the peritoneal cavity.

The streptococci can have a disturbing effect on the leucocytes. This is shown by the alteration and disappearance of the neutrophilic granules of the polymorphonuclear leucocytes, a process most marked in the granules around streptococci included within the cells.

So long as streptococci are demonstrable in the peritoneal cavity, as well as for one to two days after their disappearance, the majority of the cells present are polymorphonuclear leucocytes. Later there is for some time a leucocytosis which is chiefly mononuclear.

[The above work is ambitious, and is illustrated with many beautiful plates, but is not complete. The blood, spleen, and bone-marrow, for instance, were not studied. The most interesting portion is that on the lesions produced in the peripheal nerves and the central nervous system. The chief criticism on the work is that it is not wholly satisfactory in the study of the finer histological changes in the various organs.—Ed.]

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